



PROJECT ID: PV467ANYC

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

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

LAW

VOLUME 1 OF 3

BID BOOKLET

FOR FURNISHING ALL LABOR AND MATERIALS
NECESSARY AND REQUIRED FOR:

Archstone Clinton Theater Fit-Out for the Alliance of Resident Theatres/ New York

LOCATION: 502 West 53rd Street
BOROUGH: New York, NY 10019
CITY OF NEW YORK

CONTRACT NO. 1	GENERAL CONSTRUCTION WORK
CONTRACT NO. 2	PLUMBING WORK
CONTRACT NO. 3	HVAC + FIRE PROTECTION WORK
CONTRACT NO. 4	ELECTRICAL WORK

Department of Cultural Affairs

Toshiko Mori Architects



Date: June 20, 2013

13-067



NEW YORK CITY DEPARTMENT OF
DESIGN + CONSTRUCTION

DR. FENIOSKY A. PEÑA-MORA
Commissioner

JOHN GODDARD
Agency Chief
Contracting Officer

July 29, 2014

CERTIFIED MAIL - RETURN RECEIPT REQUEST

CHINATOWN PL & HEATING
153 Centre Street Rm108
New York, NY 10013.

RE: FMS ID: PV467ANYC
E-PIN: 85013B0122001
DDC PIN: 8502013PV0026C
PLUMBING WORK- ARCHSTONE CINTON
THEATER FIT-OUT FOR THE ALLIANCE
OF RESIDENT THEATERS/NEW YORK -
BOROUGH OF MAHATTAN
NOTICE OF AWARD

Dear Contractor:

You are hereby awarded the above referenced contract based upon your bid in the amount of \$298,550.00 submitted at the bid opening on November 26, 2013. Within ten (10) days of your receipt of this notice of award, you are required to take the actions set forth in Paragraphs (1) through (3) below. For your convenience, attached please find a copy of Schedule A of the General Conditions to the Contract, which sets forth the types and amounts of insurance coverage required for this contract.

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



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

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

Sincerely,

John Goddard

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

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

PROJECT ID: PV467ANYC

**Archstone Clinton Theater Fit-Out for the Alliance of Resident Theatres/
New York
502 West 53rd Street
New York, NY 10019**

Name of Bidder: Chinatown Plumbing & Heating Inc.

Date of Bid Opening: November 26, 2013

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

Place of Business of Bidder: 153 Centre St, Ste 108, New York, NY 10013

Bidder's Telephone Number: (212)966-9735 Bidder's Fax Number: (212)226-9571

Bidder's Email Address: chinatownpl@gmail.com

Residence of Bidder (If Individual): _____

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

Names of Partners	Residence of Partners
_____	_____
_____	_____
_____	_____

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

Organized under the laws of the State of New York

Name and Home Address of President: Jimmy Yu, 22-11 21 St, Astoria, NY 11105

Name and Home Address of Secretary: _____

Name and Home Address of Treasurer: _____

BID FORM

PROJECT ID: PV467ANYC
Contract #2 - Plumbing Work

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

A. LUMP SUM PRICE - Total price for all labor and material for all required work, excluding item (B) set forth below. Total Price shall include all costs and expenses, i.e. labor, material overhead and profit for all the Work, described and shown in the drawings and specifications.

Total Price For Labor

Total Price for Material Sold and Delivered

\$ 189,385.00 +

\$ 94,165.00

Total Price for Item A = \$ 283,550.00

B. ALLOWANCE for Incidental Asbestos Abatement
(Section 220013 of the Specifications)

\$15,000.00

TOTAL BID PRICE (Add A + B)
(a/k/a BID PROPOSAL)

\$ 298,550.00

11/26/13 P.S.

BIDDER'S SIGNATURE AND AFFIDAVIT

* **M/WBE UTILIZATION PLAN:** By signing its bid in the space below, the bidder agrees to the Vendor Certification and Required Affirmations set forth below, unless a full waiver of the Participation Goals is granted. The Vendor Certification and Required Affirmations will be deemed to satisfy the requirement to complete Section V of Part II of Schedule B: M/WBE Utilization Plan.

Section V: Vendor Certification and Required Affirmations: I hereby: 1) acknowledge my understanding of the M/WBE participation requirements as set forth in this Contract and the pertinent provisions of Section 6-129 of the Administrative Code of the City of New York ("Section 6-129"), and the rules promulgated thereunder; 2) affirm that the information supplied in support of the M/WBE Utilization Plan is true and correct; 3) agree, if awarded this Contract, to comply with the M/WBE participation requirements of this Contract, the pertinent provisions of Section 6-129, and the rules promulgated thereunder, all of which shall be deemed to be material terms of this Contract; 4) agree and affirm that it is a material term of this Contract that the Vendor will award the total dollar value of the M/WBE Participation Goals to certified MBEs and/or WBEs, unless a full waiver is obtained or such goals are modified by the Agency; and 5) agree and affirm, if awarded this Contract, to make all reasonable, good faith efforts to meet the M/WBE Participation Goals, or if a partial waiver is obtained or such goals are modified by the Agency, to meet the modified Participation Goals by soliciting and obtaining the participation of certified MBE and/or WBE firms.

Bidder: Chinatown Plumbing & Heating Inc.

By:

(Signature of Partner or corporate officer)

Attest:
(Corporate Seal)

Secretary of Corporate Bidder

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

BID FORM (TO BE NOTARIZED)

AFFIDAVIT WHERE BIDDERS IS AN INDIVIDUAL

STATE OF NEW YORK, COUNTY OF _____ ss:
_____ being duly sworn says:

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

(Signature of the person who signed the Bid)

Subscribed and sworn to before me this
_____ day of _____,

Notary Public

AFFIDAVIT WHERE BIDDERS IS A PARTNERSHIP

STATE OF NEW YORK, COUNTY OF _____ ss:
_____ being duly sworn says:

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

(Signature of Partner who signed the Bid)

Subscribed and sworn to before me this
_____ day of _____,

Notary Public

AFFIDAVIT WHERE BIDDERS IS A CORPORATION

STATE OF NEW YORK, COUNTY OF New York ss:
Jimmy Yu being duly sworn says:

I am the President of the above named corporation whose name is subscribed to and which executed
the foregoing bid. I reside at 22-11 21 St, Astoria, NY 11105
I have knowledge of the several matters therein stated, and they are in all respects true.

Jimmy Yu
(Signature of Corporate Officer who signed the Bid)

Subscribed and sworn to before me this
25th day of November, 2013

Nelson Wan
Notary Public

NELSON WAN
Notary Public, State of New York
No. 01WA6258697
Qualified in Kings County
Commission Expires April 2, 2016

AFFIRMATION

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

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

Full Name of Bidder: Chinatown Plumbing & Heating Inc.
Address: 153 Centre St, Ste 108
City: New York State: NY Zip Code: 10013

CHECK ONE BOX AND INCLUDE APPROPRIATE NUMBER:

A - Individual or Sole Proprietorship *
SOCIAL SECURITY NUMBER

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

C - Corporation
EMPLOYER IDENTIFICATION NUMBER

13-3540353

By: _____

Signature: [Signature]

Title: _____

President

If a corporation, place seal here

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

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

Qualification Form

Project ID: PV467ANYC

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

Name of Contractor: NYC Board of Education

Name of Project: Repair of Plumbing Systems

Location of Project: Various public schools

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

Name: Meerza Mohamed

Title: Region Contract Manager Phone Number: (718) 610-0272

Brief description of work completed: Repaired/Maintained plumbing systems at various public schools in Queens

Was the work performed as a prime or a subcontractor: Prime

Amount of Contract: \$ 3,724,610

Date of Completion: Ongoing

Name of Contractor: NYC Housing Authority

Name of Project: Installation of Domestic Water Heaters

Location of Project: 572 Warren St, Brooklyn, NY 11217

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

Name: Melvin Ndiangang

Title: Project Administrator Phone Number: (212) 306-2974

Brief description of work completed: Provided and installed two new domestic water heaters.

Was the work performed as a prime or a subcontractor: Prime

Amount of Contract: \$ 166,303

Date of Completion: 09/30/13



NEW YORK CITY DEPARTMENT OF
DESIGN + CONSTRUCTION

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - PLUMBING WORK

Project: Archstone Clinton Theater Fit-Out for the Alliance of Resident Theaters/ New York
 Location: 502 West 53rd Street, New York, NY 10019
 Bidder: Chinatown Plumbing & Heating Inc.

DDC ID: PV467ANYC
 Sponsor Agency: Dept of Cultural Affairs

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	CONTRACT 2 - PLUMBING WORK							
	PLUMBING							
22 0000	COMMON WORK RESULTS FOR PLUMBING							
22 0500	Cut/cap/disconnect existing plumbing fixtures prior to demolition		ls					2800
	Existing plumbing system modification due to conflict with new layout.		ls					6550
	Provide for shut downs and temporary work		ls					3550
	Access doors		ls					5440
	Core/bore/fireproofing and set sleeves at wall/floor penetrations	65	sf	27	1750	7500	7500	9250
	Water meter - 3"	1	ea	1470	1470	760	760	2250
	Motor requirements:							
	Circulator pump with (2) 4KW elements	2	ea	350	700	530	530	1230
	Circulator pump with 1 1/2 KW elements		ea					
	Subtotal				3570	8610	8610	3700
22 0519	METERS AND GAGES FOR PLUMBING (included w/ sectiond 221116 and 224000)							
22 0529	HANGERS AND SUPPORTS FOR PLUMBING PIPING							
	Noise reducing pipe hanger and support		ls		4200			4250
	Subtotal							
22 0533	HEAT TRACING FOR PLUMBING PIPING							
	Heat tracing for plumbing piping	170	lf	25	3000	4500	4500	7500
	Heat tracing system for HVAC piping		lf					
	Subtotal				3000			7500
22 0548	VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT							
	Vibration isolators		ls		4000			4750
	Subtotal				4000			4750



NEW YORK CITY DEPARTMENT OF
DESIGN + CONSTRUCTION

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - PLUMBING WORK

Project: Archstone Clinton Theater Fit-Out for the Alliance of Resident Theaters/ New York
 Location: 502 West 53rd Street, New York, NY 10019
 Bidder: Chinatown Plumbing & Heating Inc.

DDC ID: PV467ANYC
 Sponsor Agency: Dept of Cultural Affairs

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
22 0553	IDENTIFICATION FOR PLUMBING PIPING & EQUIPMENT Identification for plumbing system		ls					5255 5155
	Subtotal							
22 0700	PLUMBING INSULATION Domestic Water: Pipe insulation; 4" piping	1470	lf	2	2840		6810	9650 9650
	Subtotal							
22 0800	COMMISSIONING OF PLUMBING Commissioning - assist Enhanced commissioning - LEED requirement		ls ls					2500 2500 5000
	Subtotal							
22 1116	DOMESTIC WATER PIPING Piping: 3/4"Ø to 1 1/4"Ø HWR&S, CW 2"Ø to 3"Ø CW Misc valves	1036 380	lf lf	4.5 15.7	4716 5900		12,120 8500	16,846 14,000 4000 34,846
	Subtotal				10725		20620	
22 1119	DOMESTIC WATER PIPING SPECIALTIES (included w/ section 221116)							
22 1316	SANITARY WASTE AND VENT PIPING Sanitary Service: 2" Ø 3" Ø 4" Ø Reroute existing 4" sanitary line - to clear new stair opening Vent Service: 2" - 3" Ø	50 250 600 70	lf lf lf lf	4.2 6.24 7.2 8.3	210 1560 4320 580		1500 4500 8540 2500	1710 6060 17,860 32,500 10,300 34,360
	Subtotal				3500		7000	
	Subtotal				10,340		24,040	



NEW YORK CITY DEPARTMENT OF
DESIGN + CONSTRUCTION

Project: Archstone Clinton Theater Fit-Out for the Alliance of Resident Theaters/ New York
 Location: 502 West 53rd Street, New York, NY 10019
 Bidder: *Chinchor Plumbing & Heating*

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - PLUMBING WORK

DDC ID: PV467ANYC
 Sponsor Agency: Dept of Cultural Affairs

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
22 1319	SANITARY WASTE PIPING SPECIALTIES							
	Sanitary Service:							
	Clean outs 3" Ø - 4" Ø	25	ea	50	1250		3300	4550
	Connection to existing sanitary drains	13	ea	45	510		6000	6510
	3" Ø Floor drain	6	ea	250	1500		350	5000
	4" Ø Floor drain	3	ea	250	750		5170	2480
	Vent Service:							
	Misc gauges, trims and fittings		ls		1330		10,010	3350
	Subtotal				5790			27,150
22 3300	ELECTRIC DOMESTIC WATER HEATER							
	Electric storage water heaters	3	ea	850	2550		8925	11475
	Instant hot water heaters	3	ea	210	630		3000	5630
	Subtotal				3180		13525	17,105
22 4000	PLUMBING FIXTURES							
	Water Closet:							
	Sensor operated	7	ea	714	5000		12000	17,000
	Sensor operated-handicap	6	ea	714	4284		10,714	14,998
	Urinals - sensor operated	2	ea	600	1200		4000	5200
	Lavatories - sensor operated	12	ea	833	10000		24151	34151
	Utility sink	1	ea	1600	1600		1600	2600
	Washer connection valves; ½" Ø	1	ea	150	150		400	550
	Showers/ Shower pan and controls, handicapped	2	ea	700	1400		1500	2500
	Washer connection valves; ½" Ø	1	ea	750	1500		400	550
	Drinking fountain - ADA	1	ea	1000	1000		1750	2750
	Drinking fountain	1	ea	1000	1000		1750	2750
	Misc trim and piping		ls		2712		2500	6716
	Hose bibb	10	ea	20	200		6205	2700
	Subtotal				25954			32505
	TOTAL CONTRACT 2 - PLUMBING WORK							283,550

A. PROJECT REFERENCES - SIMILAR CONTRACTS COMPLETED BY THE BIDDER

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

Project & Location	Contract Type	Contract Amount (\$000)	Date Completed	Owner Reference & Tel. No.	Architect/Engineer Reference & Tel. No. if different from owner
NYC Board of Education Various public school	On-call plumbing (subcontractor)	\$ 1,387	11/30/11	Meerza Mohamed (718) 610-0272	
NYCHA 572 Warren St Brooklyn, NY 11217	Plumbing	\$ 166	09/30/13	Melvin Ndiangang (212) 306-2974	
65-15 164 St Flushing, NY 11365	Plumbing/ Sprinkler	\$ 157	04/26/10	Stanley Kwong (718) 463-8462	
99 Hudson St New York, NY 10013	Sprinkler	\$ 111	12/30/09	Merton Olshan (212) 935-1330	
30 W 18 St New York, NY 10011	Plumbing	\$ 100	10/26/09	Ben Hakimian (212) 683-9292	
13 Mott St New York, NY 10013	Plumbing/ Boiler	\$ 42	10/12/11	Paul Young (718) 461-2083	
139 Centre St, 501-507 New York, NY 10013	Plumbing/ Sprinkler	\$ 35	02/14/11	Franky Chan (917) 337-5103	

B. PROJECT REFERENCES - CONTRACTS CURRENTLY UNDER CONSTRUCTION BY THE BIDDER

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

Project & Location	Contract Type	Contract Amount (\$000)	Subcontracted to Others (\$000)	Uncompleted Portion (\$000)	Date Scheduled to Complete	Owner Reference & Tel. No.	Architect/Engineer Reference & Tel. No. if different from owner
NYC Board of Education Various public schools	On-call Plumbing	\$3,725	\$685	N/A	11/30/16	Meerza Mohamed (718) 610-0272	
139 Centre St, 102-103 New York, NY 10013	Plumbing / Sprinkler	\$48	\$0	\$13	12/31/13	Desmond Fong (718) 729-4736	

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

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

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

Tax ID #: 13-3540353

APT E-
PIN#: 85013B0122

Contract # 2 - Plumbing Work

SCHEDULE B - M/WBE Utilization Plan

Part I: M/WBE Participation Goals

Part I to be completed by contracting agency

Contract Overview

APT E-Pin # 85013B0122 FMS Project ID#: PV467ANYC

Project Title/Agency Archstone Clinton Theater Fit-Out for the Alliance of Resident Theatres/ New York

PIN # 8502013PV0023C

Bid/Proposal Response Date: THURSDAY, NOVEMBER 14, 2013

Contracting Agency Department of Design and Construction

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

Contact Person Norma Negrón Title MWBE Liaison & Compliance Analyst

Telephone # (718) 391-1502 Email negronn@ddc.nyc.gov

Project Description (attach additional pages if necessary)

This Project consists of the fit-out of approximately 15,000 SF of existing raw space on the ground, mezzanine and second floors of the Archstone Clinton building with two 99-seat rental theatre spaces and ancillary programs including dressing rooms, prop shops, storage, control booths and offices. The existing Archstone Clinton building was completed in 2008 by Fox Fowie and is LEED Certified. Archstone Clinton provides approximately 50,000 SF of cultural space to be shared by three theatre companies -- 52nd Street Theatre, A.R.T./New York and MCC Theatres.

M/WBE Participation Goals for Services

Enter the goals for each category in the table below. Do not specify a goal. Please note that there are no goals for Asian American and Pacific Islander.

Prime Contract Industry: Construction

Group	Percentage	
<u>Unspecified</u>	<u>20</u>	<u>%</u>
or		
<u>Black American</u>	<u>Unspecified</u>	<u>%</u>
<u>Hispanic American</u>	<u>Unspecified</u>	<u>%</u>
<u>Asian American</u>	<u>Unspecified</u>	<u>%</u>
<u>Women</u>	<u>Unspecified</u>	<u>%</u>
Total Participation Goals	20	%

Line 1

Tax ID #: 13-3540353

APT E-

PIN#: 85013B0122

Contract #2 - Plumbing Work

SCHEDULE B - Part II: M/WBE Participation Plan

Part II to be completed by the bidder/proposer:

Please note: For Non-M/WBE Prime Contractors who will NOT subcontract any services and will self-perform the entire contract, you must obtain a FULL waiver by completing the Waiver Application on pages 9 and 9a and timely submitting it to the contracting agency pursuant to the Notice to Prospective Contractors. Once a FULL WAIVER is granted, it must be included with your bid or proposal and you do not have to complete or submit this form with your bid or proposal.

Section I: Prime Contractor Contact Information

Tax ID # 13-3540353 FMS Vendor ID # _____

Business Name Chinatown Plumbing & Heating Inc. Contact Person Jimmy Yu

Address 153 Centre St. Ste 108, New York, NY 10013

Telephone # (212) 966-9735 Email chinatownpl@gmail.com

Section II: M/WBE Utilization Goal Calculation: Check the applicable box and complete subsection.

PRIME CONTRACTOR ADOPTING AGENCY M/WBE PARTICIPATION GOALS

<input type="checkbox"/> For Prime Contractors (including Qualified Joint Ventures and M/WBE firms) adopting Agency M/WBE Participation Goals.	Total Bid/Proposal Value	Agency Total Participation Goals (Line 1, Page 1)		Calculated M/WBE Participation Amount
Calculate the total dollar value of your total bid that you agree will be awarded to M/WBE subcontractors for services and/or credited to an M/WBE prime contractor or Qualified Joint Venture. Please review the Notice to Prospective Contractors for more information on how to obtain credit for M/WBE participation.	\$ 298,550	x .20	=	\$ 59,710 Line 2

PRIME CONTRACTOR OBTAINED PARTIAL WAIVER APPROVAL: ADOPTING MODIFIED M/WBE PARTICIPATION GOALS

<input type="checkbox"/> For Prime Contractors (including Qualified Joint Ventures and M/WBE firms) adopting Modified M/WBE Participation Goals.	Total Bid/Proposal Value	Adjusted Participation Goal (From Partial Waiver)		Calculated M/WBE Participation Amount
Calculate the total dollar value of your total bid that you agree will be awarded to M/WBE subcontractors for services and/or credited to an M/WBE prime contractor or Qualified Joint Venture. Please review the Notice to Prospective Contractors for more information on how to obtain credit for M/WBE participation.	\$	x	=	\$ Line 3

Section III: M/WBE Utilization Plan: How Proposer/Bidder Will Fulfill M/WBE Participation Goals. Please review the Notice to Prospective Contractors for more information on how to obtain credit for M/WBE participation. Check applicable box. The Proposer or Bidder will fulfill the M/WBE Participation Goals:

As an M/WBE Prime Contractor that will self-perform and/or subcontract to other M/WBE firms a portion of the contract the value of which is at least the amount located on Lines 2 or 3 above, as applicable. The value of any work subcontracted to non-M/WBE firms will not be credited towards fulfillment of M/WBE Participation Goals. Please check all that apply to Prime Contractor:

MBE WBE

As a Qualified Joint Venture with an M/WBE partner, in which the value of the M/WBE partner's participation and/or the value of any work subcontracted to other M/WBE firms is at least the amount located on Lines 2 or 3 above, as applicable. The value of any work subcontracted to non M/WBE firms will not be credited towards fulfillment of M/WBE Participation Goals.

As a non M/WBE Prime Contractor that will enter into subcontracts with M/WBE firms the value of which is at least the amount located on Lines 2 or 3 above, as applicable.

Section IV: General Contract information

What is the expected percentage of the total contract dollar value that you expect to award in subcontracts for services, regardless of M/WBE status? % 20

Enter a brief description of the types and dollar value of subcontracts for any services, materials, supplies, and/or labor that you intend to award for each item in the table below. The work is designed for completion by MBE and/or WBE and the time frame in which such work is scheduled to be completed. Use additional sheets if necessary.

Table with 17 numbered rows (1-17) for describing subcontracts. The content is heavily obscured by noise and is illegible.

Scopes of Subcontract Work

Section V: Vendor Certification and Required Affirmations

I hereby

- 1) acknowledge my understanding of the M/WBE participation requirements as set forth herein and the pertinent provisions of Section 6-129 of the Administrative Code of the City of New York (Section 6-129), and the rules promulgated thereunder
- 2) affirm that the information supplied in support of this M/WBE Utilization Plan is true and correct
- 3) agree, if awarded this Contract, to comply with the M/WBE participation requirements of this Contract, the pertinent provisions of Section 6-129, and the rules promulgated thereunder, all of which shall be deemed to be material terms of this Contract
- 4) agree and affirm that it is a material term of this Contract that the Vendor will award the total dollar value of the M/WBE Participation Goals to certified MBEs and/or WBEs, unless a full waiver is obtained or such goals are modified by the Agency, and
- 5) agree and affirm, if awarded this Contract, to make all reasonable, good faith efforts to meet the M/WBE Participation Goals, or if a partial waiver is obtained or such goals are modified by the Agency, to meet the modified Participation Goals by soliciting and obtaining the participation of certified MBE and/or WBE firms

Signature _____
Print Name Jimmy Yu

Date 11/25/13
Title President



SAFETY QUESTIONNAIRE

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

1. Bidder Information:

Company Name: Chinatown Plumbing & Heating Inc

DDC Project Number: PV467ANYC

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

Company has previously worked for DDC

2: Type(s) of Construction Work

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

3. Experience Modification Rate:

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

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

YEAR	INTRASTATE RATE	INTERSTATE RATE
2011	0.91	N/A
2012	0.91	N/A
2013	0.90	N/A

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

4. OSHA Information:

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

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

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

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

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

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

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

YEAR	TOTAL NUMBERS OF HOURS WORKED BY EMPLOYEES	INCIDENT RATE
<u>2010</u>	<u>17,904</u>	<u>0</u>
<u>2011</u>	<u>18,350</u>	<u>10.9</u>
<u>2012</u>	<u>24,689</u>	<u>0</u>

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

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

5. Safety Performance on Previous DDC Project(s)

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

DDC Project Number(s): _____

No Accident on previous DDC Project(s).

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

Date: 12/3/13

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

Title: President

VENDEX COMPLIANCE

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

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

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

Name of Bidder: Chinatown Plumbing & Heating Inc.
Bidder's Address: 153 Centre St, Ste 108, New York, NY 10013
Bidder's Telephone Number: (212) 966-9735
Bidder's Fax Number: (212) 226-9571
Date of Bid Opening: November 26, 2013
Project ID: PV467ANYC

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

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

Date of Submission: _____

By: _____
(Signature of Partner or corporate officer)

Print Name: _____

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

By: _____
(Signature of Partner or corporate officer)

Print Name: Jimmy Yu

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



Certificate of No Change Form

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

I, Jimmy Yu, being duly sworn, state that I have read
Enter Your Name

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

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

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

Vendor Questionnaire *This section is required.*

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

Name of Submitting Entity: Chinatown Plumbing & Heating Inc.

Vendor's Address: 153 Centre St, Ste 108, New York, NY 10013

Vendor's EIN or TIN: 13-3540353 Requesting Agency: NYC DDC

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

Signature date on the last full vendor questionnaire signed for the submitting vendor: 11/05/12

Signature date on change submission for the submitting vendor: 02/21/13

The City of New York Department of Small Business Services
Division of Labor Services Contract Compliance Unit
110 William Street, New York, New York 10038
Phone: (212) 513 - 6323
Fax: (212) 618-8879

CONSTRUCTION EMPLOYMENT REPORT

GENERAL INFORMATION

1. Your contractual relationship in this contract is: Prime contractor ___ Subcontractor ___
- 1a. Are MWBE goals attached to this project? Yes ___ No ___
2. Please check one of the following if your firm would like information on how to certify with the City of New York as a:
___ Minority Owned Business Enterprise ___ Locally based Business Enterprise
___ Women Owned Business Enterprise ___ Emerging Business Enterprise
- 2a. If you are certified as an MBE, WBE, or LBE, what city/state agency are you certified with?
_____ Are you DBE certified? Yes ___ No
3. Please indicate if you would like assistance from SBS in identifying certified MWBEs for contracting opportunities: Yes No ___
4. Is this project subject to a project labor agreement? Yes ___ No ___

PART I: CONTRACTOR/SUBCONTRACTOR INFORMATION

5. 13-3540353 chinatownpl@gmail.com
Employer Identification Number or Federal Tax I.D./ Email Address
6. Chinatown Plumbing & Heating Inc.
Company Name
7. 153 Centre St, Ste 108, New York, NY 10013
Company Address and Zip Code
8. Jimmy Yu (212) 966-9735
Chief Operating Officer Telephone Number
9. same _____
Designated Equal Opportunity Compliance Officer Telephone Number
(If same as Item #7, write "same")
10. _____
Name of Prime Contractor and Contact Person
(If same as Item #5, write "same")
11. Number of employees in your company: 10

12. Contract information:

(a) NYC DDC Contracting Agency (City Agency) (b) _____ Contract Amount

(d) _____ Procurement Identification Number (PIN) (e) _____ Contract Registration Number (CT#)

(f) _____ Projected Commencement Date (g) _____ Projected Completion Date

(h) Description and location of proposed contract:

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

If yes, attach a copy of certificate.

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

If yes, attach a copy of certificate.

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

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

Date submitted: 08/28/13
Agency to which submitted: NYC HPD
Name of Agency Person: Ms. Paulino
Contract No: _____
Telephone: (212) 863-7220

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

If yes,

(a) Name and address of OFCCP office.

(b) Was a Certificate of Equal Employment Compliance issued within the past 36 months? Yes ___ No ___

If yes, attach a copy of such certificate.

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

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

(d) Were any deficiencies found? Yes ___ No ___

If yes, attach a copy of such findings.

17. Is your company or its affiliates a member or members of an employers' trade association which is responsible for negotiating collective bargaining agreements (CBA) which affect construction site hiring? Yes ___ No

If yes, attach a list of such associations and all applicable CBA's.

PART II: DOCUMENTS REQUIRED

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

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

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

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

20. Explain where and how completed I-9 Forms, with their supportive documentation, are maintained and made accessible.
Stored in office filing cabinet
21. Does your firm or any of its collective bargaining agreements require job applicants to take a medical examination? Yes ___ No

If yes, is the medical examination given:

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

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

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

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

The two page document is located in office filing cabinet.

23. Does the company have a current affirmative action plan(s) (AAP)
- ___ Minorities and Women
- ___ Individuals with handicaps
- ___ Other. Please specify _____

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

If yes, please attach a copy of this policy.

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

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

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

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

If yes, attach a log. See instructions.

27. Are there any jobs for which there are physical qualifications? Yes ___ No

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

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

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



SIGNATURE PAGE

I, (print name of authorized official signing) Jimmy Yu hereby certify that the information submitted herewith is true and complete to the best of my knowledge and belief and submitted with the understanding that compliance with New York City's equal employment requirements, as contained in Chapter 56 of the City Charter, Executive Order No. 50 (1980), as amended, and the implementing Rules and Regulations, is a contractual obligation.

I also agree on behalf of the company to submit a certified copy of payroll records to the Division of Labor Services on a monthly basis.

Chinatown Plumbing & Heating Inc.
Contractor's Name

Jimmy Yu President
Name of person who prepared this Employment Report Title

Jimmy Yu President
Name of official authorized to sign on behalf of the contractor Title

(212) 966-9735
Telephone Number

[Signature] 11/25/13
Signature of authorized official Date

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

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

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

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

Only original signatures accepted.

Sworn to before me this 25th day of November 2013

Nelson Wan Notary Public
[Signature] Authorized Signature
Date 11/25/13

NELSON WAN
Notary Public, State of New York
No. 01WA6258697
Qualified in Kings County
Commission Expires April 2, 2016

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


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

[Please Check One]

BIDDER'S CERTIFICATION

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

Dated: New York, New York
11/25, 20 13



SIGNATURE

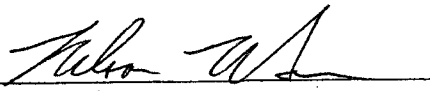
Jimmy Yu

PRINTED NAME

President

TITLE

Sworn to before me this
25th day of Nov., 20 13



Notary Public

Dated: 11/25/13 NELSON WAN
Notary Public, State of New York
No. 01WA6258697
Qualified in Kings County
Commission Expires April 2, 2016



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

October 23, 2013

ADDENDUM No. # 1

FOR FURNISHING ALL LABOR AND MATERIAL NECESSARY AND REQUIRED FOR:

PV467ANYC

Archstone Clinton Theater Fit-Out for the Alliance of Resident Theatres/New York

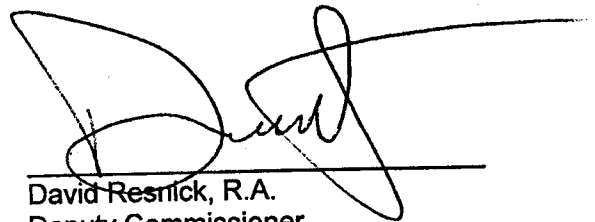
This addendum is issued for the purpose of amending the requirements of the Bid and Contract Documents and is hereby made a part of said Bid and Contract Documents to the same extent as though it were originally included therein.

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

- 1. Revisions to the Addendum to the General Conditions:**
Delete page 8 and replace with revised page 8R.

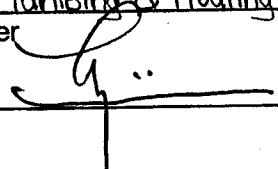
THIS ADDENDUM MUST BE SIGNED BY ALL BIDDERS AND ATTACHED TO THEIR BIDS.

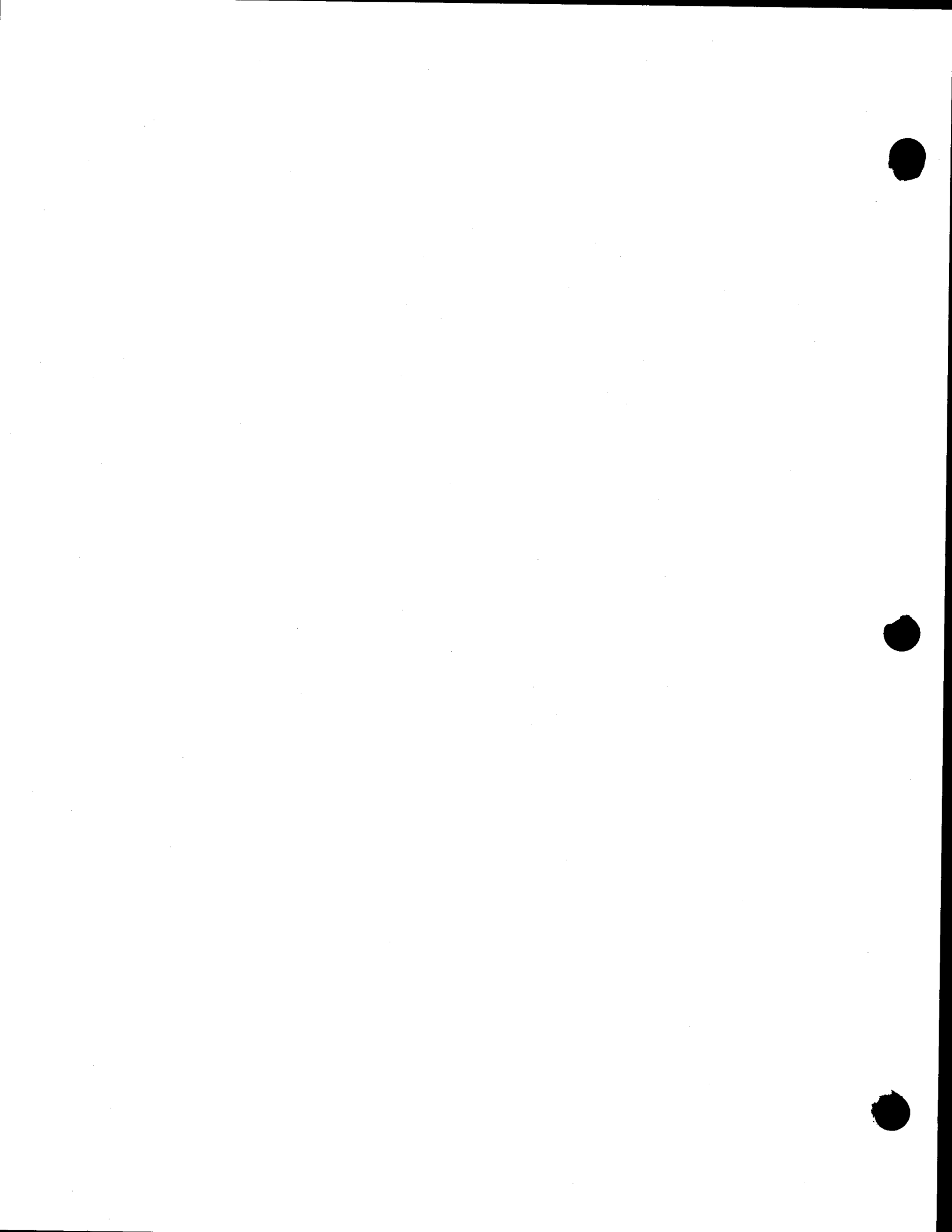
If additional information is required, please contact the Department of Design and Construction, Contract Section at (718) 391-2200, (718) 391-1727, or by fax at (718) 391-2615.



David Resnick, R.A.
Deputy Commissioner

Chinatown Plumbing & Heating Inc.
Name of Bidder

By: 



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

October 23, 2013

ADDENDUM No. # 2

FOR FURNISHING ALL LABOR AND MATERIAL NECESSARY AND REQUIRED FOR:

PV467ANYC

Archstone Clinton Theater Fit-Out for the Alliance of Resident Theatres/New York

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

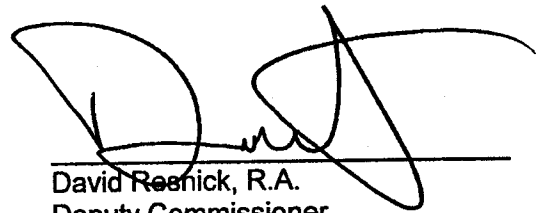
The bidder is advised that the items listed below apply to the project:

1. Revisions to the Bid Booklet:

Delete page 24 and replace with revised page 24R.

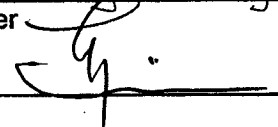
THIS ADDENDUM MUST BE SIGNED BY ALL BIDDERS AND ATTACHED TO THEIR BIDS.

If additional information is required, please contact the Department of Design and Construction, Contract Section at (718) 391-2200, (718) 391-1283, or by fax at (718) 391-2615.



David Resnick, R.A.
Deputy Commissioner

Chinatown Plumbing & Heating Inc.
Name of Bidder

By: 



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

November 18, 2013

ADDENDUM No. # 3

FOR FURNISHING ALL LABOR AND MATERIAL NECESSARY AND REQUIRED FOR:

PV467ANYC

Archstone Clinton Theater Fit-Out for the Alliance of Resident Theatres/New York

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

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

1. **Revised Bid Opening Date:**
The Bid Opening for the Contract described below has been rescheduled to November 26, 2013, at 2:00pm.

Contract 1 – General Construction Work
Contract 2 – Plumbing Work
Contract 3 – HVAC Work
Contract 4 – Electrical Work
2. **Questions from Bidders and Responses to Questions:**
See Attachment A.
3. **Revisions to the Bid Booklet:**
See Attachment B.
3. **Revisions to the Addendum to the General Conditions:**
See Attachment C.
3. **Revisions to the Specifications:**
See Attachment D.
4. **Revisions to the Drawings:**
See Attachment E.

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

If additional information is required, please contact the Department of Design and Construction, Contract Section at (718) 391-2200, (718) 391-1283, or by fax at (718) 391-2615.


David Resnick, R.A.
Deputy Commissioner

Chinatown Plumbing & Heating Inc.
Name of Bidder

By: 



**BID BOOKLET
PART A**

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

BID BOOKLET

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

SPECIAL NOTICE TO BIDDERS

BID SUBMISSION REQUIREMENTS

**THE FOLLOWING DOCUMENTS ARE TO BE COMPLETED
AND SUBMITTED WITH THE BID:**

- Bid Form, including Affirmation
- Bid Security (if required, see page 22)
- Schedule B: M/WBE Utilization Plan (if participation goals have been established)

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

- Bid Breakdown (if required, see page 21)
- Safety Questionnaire
- Construction Employment Report (if bid is \$1,000,000 or more)
- Contract Certificate (if bid is less than \$1,000,000)
- Confirmation of Vendex Compliance
- Special Experience Requirements Qualification Form (if required, see pages 3, 4)
- Bidder's Certification of Compliance with Iran Divestment Act
- Apprenticeship Program Requirements (if required, see pages 10, 11)
- Any Addenda issued prior to the receipt of bids.

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

- NOTES:**
- (1) All of the above referred to blank forms to be completed and submitted with the bid are included in the BID BOOKLET.
 - (2) If the bidder has any questions or requires additional information, please contact the Department of Design and Construction by phone (718-391-2601) or by fax (718-391-2615).
 - (3) **VENDEX QUESTIONNAIRES:** Vendex Questionnaires, as well as detailed instructions, may be obtained at www.nyc.gov/vendex. The bidder may also obtain Vendex forms and instructions by contacting the Agency Chief Contracting Officer or the contact person for this contract.
 - (4) **SPECIAL EXPERIENCE REQUIREMENTS:** The Bidder is advised that Special Experience Requirements may apply to this contract. Such requirements are set forth on pages 3 and 4 of this Bid Booklet.
 - (5) **SPECIAL EXPERIENCE REQUIREMENTS FOR ASBESTOS:** The Bidder is advised that this contract contains strict requirements regarding the prior experience and licensing of the subcontractor who will perform any required asbestos abatement work. These special experience requirements are set forth in the section of the specifications which describes any required asbestos abatement work.

SPECIAL EXPERIENCE REQUIREMENTS

Special Experience Requirements apply as indicated below.

Bidder(s):	General Construction	<u> x </u>	YES	<u> </u>	NO
	Plumbing Work	<u> </u>	YES	<u> x </u>	NO
	HVAC Work	<u> </u>	YES	<u> x </u>	NO
	Electrical Work	<u> x </u>	YES	<u> </u>	NO
Specific Areas of Work:	General Construction	<u> </u>	YES	<u> x </u>	NO
	Plumbing Work	<u> </u>	YES	<u> x </u>	NO
	HVAC Work	<u> </u>	YES	<u> x </u>	NO
	Electrical Work	<u> x </u>	YES	<u> </u>	NO

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

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

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

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

- Any principal or other employee on whose prior experience the bidder is relying to demonstrate compliance with this special experience requirement must have held the following: (a) a significant management role in the prior entity with which he/she was affiliated, and (b) a significant management role in the entity submitting the bid for a period of six months or from the inception of the bidding entity. If the bidder is relying on the prior experience of a principal or employee, it must submit documentation confirming the position held by such principal or employee in the prior entity, as well as in the bidding entity.
- The bidder may not rely on the experience of its principals or other employees to demonstrate compliance with any other requirements, including without limitation, financial requirements or requirements for a specified minimum amount of annual gross revenues.

(D) **JOINT VENTURES:** In the event the bidder is a joint venture, at least one firm in the joint venture must meet the above described experience requirements.

(E) **EXPERIENCE REQUIREMENTS FOR SPECIFIC AREAS OF WORK:** The special experience requirements set forth below apply to the contractor or subcontractor that will perform specific areas of work. Compliance with such experience requirements will be evaluated after an award of contract. Within two (2) weeks of such award, the contractor will be required to submit the qualifications of the contractor or subcontractor that will perform these specific areas of work. If the bidder intends to perform these specific areas of work with its own forces, it must demonstrate compliance with the special experience requirements. If the bidder intends to subcontract these specific areas of work, its proposed subcontractor(s) must demonstrate compliance with the special experience requirements. Once approved, no substitution will be permitted, unless the qualifications of the proposed replacement have been approved in writing in advance by the City. The bidder is advised to carefully review these special experience requirements prior to submitting its bid, as such experience requirements will be strictly enforced.

- (1) Special experience requirements apply to the contractor or subcontractor that will perform specific areas of work specified in the section(s) set forth below.

Electrical Work

- Section 28 31 11: Fire Alarm System

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

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

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

Qualification Form

Project ID: PV467ANYC

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

Name of Contractor: _____

Name of Project: _____

Location of Project: _____

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

Name: _____

Title: _____ Phone Number: _____

Brief description of work completed: _____

Was the work performed as a prime or a subcontractor: _____

Amount of Contract: _____

Date of Completion: _____

Name of Contractor: _____

Name of Project: _____

Location of Project: _____

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

Name: _____

Title: _____ Phone Number: _____

Brief description of work completed: _____

Was the work performed as a prime or a subcontractor: _____

Amount of Contract: _____

Date of Completion: _____

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MWBE PROGRAM

M/WBE UTILIZATION PLAN

M/WBE Program Requirements: The requirements for the M/WBE Program are set forth on the following pages of this Bid Booklet, in the section entitled "Notice to All Prospective Contractors".

Schedule B: M/WBE Utilization Plan: Schedule B: M/WBE Utilization Plan for this Contract is set forth in this Bid Booklet on the pages following the section entitled "Notice to All Prospective Contractors". The M/WBE Utilization Plan (Part I) indicates whether Participation Goals have been established for this Contract. If Participation Goals have been established for this Contract, the bidder must submit an M/WBE Utilization Plan (Part II) with its bid.

Waiver: The bidder may seek a full or partial pre-award waiver of the Participation Goals in accordance with the "Notice to All Prospective Contractors" (See Part A, Section 10). The bidder's request for a waiver must be submitted at least seven (7) calendar days prior to the bid date. Waiver requests submitted after the deadline will not be considered. The form for requesting a waiver of the Participation Goals is set forth in the M/WBE Utilization Plan (Part III).

Rejection of the Bid: The bidder must complete Schedule B: M/WBE Utilization Plan (Part II) set forth in this Bid Booklet on the pages following the section entitled "Notice to All Prospective Contractors". A Schedule B submitted by the bidder which does not include the Vendor Certification and Required Affirmations (See Section V of Part II) will be deemed to be non-responsive, unless a full waiver of the Participation Goals is granted (Schedule B, Part III). In the event that the City determines that the bidder has submitted a Schedule B where the Vendor Certification and Required Affirmations are completed but other aspects of the Schedule B are not complete, or contain a copy or computation error that is at odds with the Vendor Certification and Required Affirmations, the bidder will be notified by the Agency and will be given four (4) calendar days from receipt of notification to cure the specified deficiencies and return a completed Schedule B to the Agency. Failure to do so Receipt of notification is defined as the date notice is emailed or faxed (if the bidder has provided an email address or fax number), or no later than five (5) days from the date of mailing or upon delivery, if delivered.

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

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NOTICE TO ALL PROSPECTIVE CONTRACTORS

PARTICIPATION BY MINORITY-OWNED AND WOMEN-OWNED BUSINESS
ENTERPRISES IN CITY PROCUREMENT

ARTICLE I. M/WBE PROGRAM

Local Law No. 129 of 2005 added and Local Law 1 of 2013 amended Section 6-129 of the Administrative Code of the City of New York (hereinafter "Section 6-129"). Section 6-129 establishes the program for participation in City procurement ("M/WBE Program") by minority-owned business enterprises ("MBEs") and women-owned business enterprises ("WBEs"), certified in accordance with Section 1304 of the New York City Charter. As stated in Section 6-129, the intent of the program is to address the impact of discrimination on the City's procurement process, and to promote the public interest in avoiding fraud and favoritism in the procurement process, increasing competition for City business, and lowering contract costs. The contract provisions contained herein are pursuant to Section 6-129, and the rules of the Department of Small Business Services ("DSBS") promulgated thereunder.

If this Contract is subject to the M/WBE Program established by Section 6-129, the specific requirements of MBE and/or WBE participation for this Contract are set forth in Schedule B of the Contract (entitled the "M/WBE Utilization Plan"), and are detailed below. The Contractor must comply with all applicable MBE and WBE requirements for this Contract.

All provisions of Section 6-129 are hereby incorporated in the Contract by reference and all terms used herein that are not defined herein shall have the meanings given such terms in Section 6-129. Article I, Part A, below, sets forth provisions related to the participation goals for construction, standard and professional services contracts. Article I, Part B, below, sets forth miscellaneous provisions related to the M/WBE Program.

PART A

PARTICIPATION GOALS FOR CONSTRUCTION, STANDARD
AND PROFESSIONAL SERVICES CONTRACTS OR TASK ORDERS

1. The **MBE and/or WBE Participation Goals** established for this Contract or Task Orders issued pursuant to this Contract, ("Participation Goals"), as applicable, are set forth on Schedule B, Part I to this Contract (see Page 1, line 1 Total Participation Goals) or will be set forth on Schedule B, Part I to Task Orders issued pursuant to this Contract, as applicable.

The **Participation Goals** represent a percentage of the total dollar value of the Contract or Task Order, as applicable, that may be achieved by awarding subcontracts to firms certified with New York City Department of Small Business Services as MBEs and/or WBEs, and/or by crediting the participation of prime contractors and/or qualified joint ventures as provided in Section 3 below, unless the goals have been waived or modified by Agency in accordance with Section 6-129 and Part A, Sections 10 and 11 below, respectively.

2. If **Participation Goals** have been established for this Contract or Task Orders issued pursuant to this Contract, Contractor agrees or shall agree as a material term of the Contract that Contractor shall be subject to the **Participation Goals**, unless the goals are waived or modified by Agency in accordance with Section 6-129 and Part A, Sections 10 and 11 below, respectively.
3. If **Participation Goals** have been established for this Contract or Task Order issued pursuant to this Contract, a Contractor that is an MBE and/or WBE shall be permitted to count its own participation toward fulfillment of the relevant **Participation Goal**, provided that in accordance with Section 6-129 the value of Contractor's participation shall be determined by subtracting from the total value of the Contract or Task Order, as applicable, any amounts that the Contractor pays to direct subcontractors (as defined in Section 6-129(c)(13)), and provided further that a Contractor that is certified as both an MBE and a WBE may count its own participation either toward the goal for MBEs or the goal for WBEs, but not both.

A Contractor that is a qualified joint venture (as defined in Section 6-129(c)(30)) shall be permitted to count a percentage of its own participation toward fulfillment of the relevant **Participation Goal**. In accordance with Section 6-129, the value of Contractor's participation shall be determined by subtracting from the total value of the Contract or Task Order, as applicable, any amounts that Contractor pays to direct subcontractors, and then multiplying the remainder by the percentage to be applied to total profit to

determine the amount to which an MBE or WBE is entitled pursuant to the joint venture agreement, provided that where a participant in a joint venture is certified as both an MBE and a WBE, such amount shall be counted either toward the goal for MBEs or the goal for WBEs, but not both.

4. A. If **Participation Goals** have been established for this Contract, a prospective contractor shall be required to submit with its bid or proposal, as applicable, a completed Schedule B, M/WBE Utilization Plan, Part II (see Pages 2-4) indicating: (a) whether the contractor is an MBE or WBE, or qualified joint venture; (b) the percentage of work it intends to award to direct subcontractors; and (c) in cases where the contractor intends to award direct subcontracts, a description of the type and dollar value of work designated for participation by MBEs and/or WBEs, and the time frames in which such work is scheduled to begin and end. In the event that this M/WBE Utilization Plan indicates that the bidder or proposer, as applicable, does not intend to meet the **Participation Goals**, the bid or proposal, as applicable, shall be deemed non-responsive, unless Agency has granted the bidder or proposer, as applicable, a pre-award waiver of the Participation Goals in accordance with Section 6-129 and Part A, Section 10 below.

B. (i) If this Contract is for a master services agreement or other requirements type contract that will result in the issuance of Task Orders that will be individually registered ("Master Services Agreement") and is subject to M/WBE **Participation Goals**, a prospective contractor shall be required to submit with its bid or proposal, as applicable, a completed Schedule B, M/WBE Participation Requirements for Master Services Agreements That Will Require Individually Registered Task Orders, Part II (page 2) indicating the prospective contractor's certification and required affirmations to make all reasonable good faith efforts to meet participation goals established on each individual Task Order issued pursuant to this Contract, or if a partial waiver is obtained or such goals are modified by the Agency, to meet the modified **Participation Goals** by soliciting and obtaining the participation of certified MBE and/or WBE firms. In the event that the Schedule B indicates that the bidder or proposer, as applicable, does not intend to meet the **Participation Goals** that may be established on Task Orders issued pursuant to this Contract, the bid or proposal, as applicable, shall be deemed non-responsive.

(ii) **Participation Goals** on a Master Services Agreement will be established for individual Task Orders issued after the Master Services Agreement is awarded. If **Participation Goals** have been established on a Task Order, a contractor shall be required to submit a Schedule B – M/WBE Utilization Plan For Independently Registered Task Orders That Are Issued Pursuant to Master Services Agreements, Part II (see Pages 2-4) indicating: (a) whether the contractor is an MBE or WBE, or qualified joint venture; (b) the percentage of work it intends to award to direct subcontractors; and (c) in cases where the contractor intends to award direct subcontracts, a description of the type and dollar value of work designated for participation by MBEs and/or WBEs, and the time frames in which such work is scheduled to begin and end. The contractor must engage in good faith efforts to meet the **Participation Goals** as established on the Task Order unless Agency has granted the contractor a pre-award waiver of the Participation Goals in accordance with Section 6-129 and Part A, Section 10 below.

C. THE BIDDER/PROPOSER MUST COMPLETE THE SCHEDULE B INCLUDED HEREIN (SCHEDULE B, PART II). A SCHEDULE B SUBMITTED BY THE BIDDER/PROPOSER WHICH DOES NOT INCLUDE THE VENDOR CERTIFICATION AND REQUIRED AFFIRMATIONS (SEE SECTION V OF PART II) WILL BE DEEMED TO BE NON-RESPONSIVE, UNLESS A FULL WAIVER OF THE PARTICIPATION GOALS IS GRANTED (SCHEDULE B, PART III). IN THE EVENT THAT THE CITY DETERMINES THAT THE BIDDER/PROPOSER HAS SUBMITTED A SCHEDULE B WHERE THE VENDOR CERTIFICATION AND REQUIRED AFFIRMATIONS ARE COMPLETED BUT OTHER ASPECTS OF THE SCHEDULE B ARE NOT COMPLETE, OR CONTAIN A COPY OR COMPUTATION ERROR THAT IS AT ODDS WITH THE VENDOR CERTIFICATION AND AFFIRMATIONS, THE BIDDER/PROPOSER WILL BE NOTIFIED BY THE AGENCY AND WILL BE GIVEN FOUR (4) CALENDAR DAYS FROM RECEIPT OF NOTIFICATION TO CURE THE SPECIFIED DEFICIENCIES AND RETURN A COMPLETED SCHEDULE B TO THE AGENCY. FAILURE TO DO SO WILL RESULT IN A DETERMINATION THAT THE BID/PROPOSAL IS NON-RESPONSIVE. RECEIPT OF NOTIFICATION IS DEFINED AS THE DATE NOTICE IS E-MAILED OR FAXED (IF THE BIDDER/PROPOSER HAS PROVIDED AN E-MAIL ADDRESS OR FAX NUMBER), OR NO LATER THAN FIVE (5) CALENDAR DAYS FROM THE DATE OF MAILING OR UPON DELIVERY, IF DELIVERED.

5. Where an M/WBE Utilization Plan has been submitted, the Contractor shall, within 30 days of issuance by Agency of a notice to proceed, submit a list of proposed persons or entities to which it intends to award subcontracts within the subsequent 12 months. In the case of multi-year contracts, such list shall also be submitted every year thereafter. The Agency may also require the Contractor to report periodically about the contracts awarded by its direct subcontractors to indirect subcontractors (as defined in Section 6-129(c)(22)). **PLEASE NOTE: If this Contract is a public works project subject to GML §101(5) (i.e., a contract valued at or below \$3M for projects in New York City) or if the Contract is subject to a project labor agreement in accordance with Labor Law §222, and**

the bidder is required to identify at the time of bid submission its intended subcontractors for the Wicks trades (plumbing and gas fitting; steam heating, hot water heating, ventilating and air conditioning (HVAC); and electric wiring), the Contractor must identify all those to which it intends to award construction subcontracts for any portion of the Wicks trade work at the time of bid submission, regardless of what point in the life of the contract such subcontracts will occur. In identifying intended subcontractors in the bid submission, bidders may satisfy any Participation Goals established for this Contract by proposing one or more subcontractors that are MBEs and/or WBEs for any portion of the Wicks trade work. In the event that the Contractor's selection of a subcontractor is disapproved, the Contractor shall have a reasonable time to propose alternate subcontractors.

6. MBE and WBE firms must be certified by DSBS in order for the Contractor to credit such firms' participation toward the attainment of the **Participation Goals**. Such certification must occur prior to the firms' commencement of work. A list of MBE and WBE firms may be obtained from the DSBS website at www.nyc.gov/buycertified, by emailing DSBS at buyer@sbs.nyc.gov, by calling (212) 513-6356, or by visiting or writing DSBS at 110 William St., New York, New York, 10038, 7th floor. Eligible firms that have not yet been certified may contact DSBS in order to seek certification by visiting www.nyc.gov/getcertified, emailing MWBE@sbs.nyc.gov, or calling the DSBS certification helpline at (212) 513-6311. A firm that is certified as both an MBE and a WBE may be counted either toward the goal for MBEs or the goal for WBEs, but not both. No credit shall be given for participation by a graduate MBE or graduate WBE, as defined in Section 6-129(c)(20).

7. Where an M/WBE Utilization Plan has been submitted, the Contractor shall, with each voucher for payment, and/or periodically as Agency may require, submit statements, certified under penalty of perjury, which shall include, but not be limited to, the total amount the Contractor paid to its direct subcontractors, and, where applicable pursuant to Section 6-129(j), the total amount direct subcontractors paid to indirect subcontractors; the names, addresses and contact numbers of each MBE or WBE hired as a subcontractor by the Contractor, and, where applicable, hired by any of the Contractor's direct subcontractors; and the dates and amounts paid to each MBE or WBE. The Contractor shall also submit, along with its voucher for final payment: the total amount it paid to subcontractors, and, where applicable pursuant to Section 6-129(j), the total amount its direct subcontractors paid directly to their indirect subcontractors; and a final list, certified under penalty of perjury, which shall include the name, address and contact information of each subcontractor that is an MBE or WBE, the work performed by, and the dates and amounts paid to each.

8. If payments made to, or work performed by, MBEs or WBEs are less than the amount specified in the Contractor's M/WBE Utilization Plan, Agency shall take appropriate action, in accordance with Section 6-129 and Article II below, unless the Contractor has obtained a modification of its M/WBE Utilization Plan in accordance with Section 6-129 and Part A, Section 11 below.

9. Where an M/WBE Utilization Plan has been submitted, and the Contractor requests a change order the value of which exceeds the greater of 10 percent of the Contract or Task Order, as applicable, or \$500,000, Agency shall review the scope of work for the Contract or Task Order, as applicable, and the scale and types of work involved in the change order, and determine whether the **Participation Goals** should be modified.

10. Pre-award waiver of the **Participation Goals**. (a) A bidder or proposer, or contractor with respect to a Task Order, may seek a pre-award full or partial waiver of the **Participation Goals** in accordance with Section 6-129, which requests that Agency change one or more **Participation Goals** on the grounds that the **Participation Goals** are unreasonable in light of the availability of certified firms to perform the services required, or by demonstrating that it has legitimate business reasons for proposing a lower level of subcontracting in its M/WBE Utilization Plan.

(b) To apply for a full or partial waiver of the **Participation Goals**, a bidder, proposer, or contractor, as applicable, must complete Part III (Page 5) of Schedule B and submit such request no later than seven (7) calendar days prior to the date and time the bids, proposals, or Task Orders are due, in writing to the Agency by email at poped@ddc.nyc.gov or via facsimile at (718) 391-1886. Bidders, proposers, or contractors, as applicable, who have submitted requests will receive an Agency response by no later than two (2) calendar days prior to the due date for bids, proposals, or Task Orders; provided, however, that if that date would fall on a weekend or holiday, an Agency response will be provided by close-of-business on the business day before such weekend or holiday date.

(c) If the Agency determines that the **Participation Goals** are unreasonable in light of the availability of certified firms to perform the services required, it shall revise the solicitation and extend the deadline for bids and proposals, or revise the Task Order, as applicable.

(d) Agency may grant a full or partial waiver of the Participation Goals to a bidder, proposer or contractor, as applicable, who demonstrates—before submission of the bid, proposal or Task Order, as applicable—that it has legitimate business reasons for proposing the level of subcontracting in its M/WBE Utilization Plan. In making its determination, Agency shall consider factors that shall include, but not be limited to, whether the bidder, proposer or contractor, as applicable, has the capacity and the bona fide intention to perform the Contract without any subcontracting, or to perform the Contract without awarding the amount of subcontracts represented by the Participation Goals. In making such determination, Agency may consider whether the M/WBE Utilization Plan is consistent with past subcontracting practices of the bidder, proposer or contractor, as applicable, whether the bidder, proposer or contractor, as applicable, has made efforts to form a joint venture with a certified firm, and whether the bidder, proposer, or contractor, as applicable, has made good faith efforts to identify other portions of the Contract that it intends to subcontract.

11. Modification of M/WBE Utilization Plan. (a) A Contractor may request a modification of its M/WBE Utilization Plan after award of this Contract. PLEASE NOTE: If this Contract is a public works project subject to GML §101(5) (i.e., a contract valued at or below \$3M for projects in New York City) or if the Contract is subject to a project labor agreement in accordance with Labor Law §222, and the bidder is required to identify at the time of bid submission its intended subcontractors for the Wicks trades (plumbing and gas fitting; steam heating, hot water heating, ventilating and air conditioning (HVAC); and electric wiring), the Contractor may request a Modification of its M/WBE Utilization Plan as part of its bid submission. The Agency may grant a request for Modification of a Contractor's M/WBE Utilization Plan if it determines that the Contractor has established, with appropriate documentary and other evidence, that it made reasonable, good faith efforts to meet the Participation Goals. In making such determination, Agency shall consider evidence of the following efforts, as applicable, along with any other relevant factors:

- (i) The Contractor advertised opportunities to participate in the Contract, where appropriate, in general circulation media, trade and professional association publications and small business media, and publications of minority and women's business organizations;
- (ii) The Contractor provided notice of specific opportunities to participate in the Contract, in a timely manner, to minority and women's business organizations;
- (iii) The Contractor sent written notices, by certified mail or facsimile, in a timely manner, to advise MBEs or WBEs that their interest in the Contract was solicited;
- (iv) The Contractor made efforts to identify portions of the work that could be substituted for portions originally designated for participation by MBEs and/or WBEs in the M/WBE Utilization Plan, and for which the Contractor claims an inability to retain MBEs or WBEs;
- (v) The Contractor held meetings with MBEs and/or WBEs prior to the date their bids or proposals were due, for the purpose of explaining in detail the scope and requirements of the work for which their bids or proposals were solicited;
- (vi) The Contractor made efforts to negotiate with MBEs and/or WBEs as relevant to perform specific subcontracts, or act as suppliers or service providers;
- (vii) Timely written requests for assistance made by the Contractor to Agency's M/WBE liaison officer and to DSBS;
- (viii) Description of how recommendations made by DSBS and Agency were acted upon and an explanation of why action upon such recommendations did not lead to the desired level of participation of MBEs and/or WBEs.

Agency's M/WBE officer shall provide written notice to the Contractor of the determination.

(b) The Agency may modify the Participation Goals when the scope of the work has been changed by the Agency in a manner that affects the scale and types of work that the Contractor indicated in its M/WBE Utilization Plan would be awarded to subcontractors.

12. If this Contract is for an indefinite quantity of construction, standard or professional services or is a requirements type contract and the Contractor has submitted an M/WBE Utilization Plan and has committed to subcontract work to MBEs and/or WBEs in order to meet the Participation Goals, the Contractor will not be deemed in violation of the M/WBE Program requirements for this Contract with regard to any work which was intended to be subcontracted to an MBE and/or WBE to the extent that the Agency has determined that such work is not needed.

13. If Participation Goals have been established for this Contract or a Task Order issued pursuant to this Contract, at least once annually during the term of the Contract or Task Order, as applicable, Agency shall review the Contractor's progress toward attainment of its M/WBE Utilization Plan, including but not limited to, by reviewing the percentage of work the Contractor has actually awarded to MBE and/or WBE subcontractors and the payments the Contractor made to such subcontractors.

14. If **Participation Goals** have been established for this Contract or a Task Order issued pursuant to this Contract, Agency shall evaluate and assess the Contractor's performance in meeting those goals, and such evaluation and assessment shall become part of the Contractor's overall contract performance evaluation.

PART B: MISCELLANEOUS

1. The Contractor shall take notice that, if this solicitation requires the establishment of an **M/WBE** Utilization Plan, the resulting contract may be audited by DSBS to determine compliance with Section 6-129. See §6-129(e)(10). Furthermore, such resulting contract may also be examined by the City's Comptroller to assess compliance with the **M/WBE** Utilization Plan.
2. Pursuant to DSBS rules, construction contracts that include a requirement for an **M/WBE** Utilization Plan shall not be subject to the law governing Locally Based Enterprises set forth in Section 6-108.1 of the Administrative Code of the City of New York.
3. DSBS is available to assist contractors and potential contractors in determining the availability of MBEs and/or WBEs to participate as subcontractors, and in identifying opportunities that are appropriate for participation by MBEs and/or WBEs in contracts.
4. Prospective contractors are encouraged to enter into qualified joint venture agreements with MBEs and/or WBEs as defined by Section 6-129(c)(30).
5. By submitting a bid or proposal the Contractor hereby acknowledges its understanding of the M/WBE Program requirements set forth herein and the pertinent provisions of Section 6-129, and any rules promulgated thereunder, and if awarded this Contract, the Contractor hereby agrees to comply with the M/WBE Program requirements of this Contract and pertinent provisions of Section 6-129, and any rules promulgated thereunder, all of which shall be deemed to be material terms of this Contract. The Contractor hereby agrees to make all reasonable, good faith efforts to solicit and obtain the participation of MBEs and/or WBEs to meet the required **Participation Goals**.

ARTICLE II. ENFORCEMENT

1. If Agency determines that a bidder or proposer, as applicable, has, in relation to this procurement, violated Section 6-129 or the DSBS rules promulgated pursuant to Section 6-129, Agency may disqualify such bidder or proposer, as applicable, from competing for this Contract and the Agency may revoke such bidder's or proposer's prequalification status, if applicable.
2. Whenever Agency believes that the Contractor or a subcontractor is not in compliance with Section 6-129 or the DSBS rules promulgated pursuant to Section 6-129, or any provision of this Contract that implements Section 6-129, including, but not limited to any **M/WBE** Utilization Plan, Agency shall send a written notice to the Contractor describing the alleged noncompliance and offering the Contractor an opportunity to be heard. Agency shall then conduct an investigation to determine whether such Contractor or subcontractor is in compliance.
3. In the event that the Contractor has been found to have violated Section 6-129, the DSBS rules promulgated pursuant to Section 6-129, or any provision of this Contract that implements Section 6-129, including, but not limited to, any **M/WBE** Utilization Plan, Agency may determine that one of the following actions should be taken:
 - (a) entering into an agreement with the Contractor allowing the Contractor to cure the violation;
 - (b) revoking the Contractor's pre-qualification to bid or make proposals for future contracts;
 - (c) making a finding that the Contractor is in default of the Contract;
 - (d) terminating the Contract;
 - (e) declaring the Contractor to be in breach of Contract;
 - (f) withholding payment or reimbursement;
 - (g) determining not to renew the Contract;
 - (h) assessing actual and consequential damages;

- (i) assessing liquidated damages or reducing fees, provided that liquidated damages may be based on amounts representing costs of delays in carrying out the purposes of the M/WBE Program, or in meeting the purposes of the Contract, the costs of meeting utilization goals through additional procurements, the administrative costs of investigation and enforcement, or other factors set forth in the Contract;
- (j) exercising rights under the Contract to procure goods, services or construction from another contractor and charge the cost of such contract to the Contractor that has been found to be in noncompliance; or
- (k) taking any other appropriate remedy.

4. If an **M/WBE** Utilization Plan has been submitted, and pursuant to this Article II, Section 3, the Contractor has been found to have failed to fulfill its **Participation Goals** contained in its **M/WBE** Utilization Plan or the **Participation Goals** as modified by Agency pursuant to Article I, Part A, Section 11, Agency may assess liquidated damages in the amount of ten percent (10%) of the difference between the dollar amount of work required to be awarded to MBE and/or WBE firms to meet the **Participation Goals** and the dollar amount the Contractor actually awarded and paid, and/or credited, to MBE and/or WBE firms. In view of the difficulty of accurately ascertaining the loss which the City will suffer by reason of Contractor's failure to meet the **Participation Goals**, the foregoing amount is hereby fixed and agreed as the liquidated damages that the City will suffer by reason of such failure, and not as a penalty. Agency may deduct and retain out of any monies which may become due under this Contract the amount of any such liquidated damages; and in case the amount which may become due under this Contract shall be less than the amount of liquidated damages suffered by the City, the Contractor shall be liable to pay the difference.

5. Whenever Agency has reason to believe that an MBE and/or WBE is not qualified for certification, or is participating in a contract in a manner that does not serve a commercially useful function (as defined in Section 6-129(c)(8)), or has violated any provision of Section 6-129, Agency shall notify the Commissioner of DSBS who shall determine whether the certification of such business enterprise should be revoked.

6. Statements made in any instrument submitted to Agency pursuant to Section 6-129 shall be submitted under penalty of perjury and any false or misleading statement or omission shall be grounds for the application of any applicable criminal and/or civil penalties for perjury. The making of a false or fraudulent statement by an MBE and/or WBE in any instrument submitted pursuant to Section 6-129 shall, in addition, be grounds for revocation of its certification.

7. The Contractor's record in implementing its **M/WBE** Utilization Plan shall be a factor in the evaluation of its performance. Whenever Agency determines that a Contractor's compliance with an **M/WBE** Utilization Plan has been unsatisfactory, Agency shall, after consultation with the City Chief Procurement Officer, file an advice of caution form for inclusion in VENDEX as caution data.

Tax ID #: _____

APT E-
PIN#: 85013B0121

Contract # 1 - General Construction Work

SCHEDULE B - M/WBE Utilization Plan

Part I: M/WBE Participation Goals

Part I to be completed by contracting agency

Contract Overview

APT E-Pin # 85013B0121 FMS Project ID#: PV467ANYC

Project Title/Agency Archstone Clinton Theater Fit-Out for the Alliance of Resident Theatres/ New York

PIN # 8502013PV0023C

Bid/Proposal Response Date: THURSDAY, NOVEMBER 14, 2013

Contracting Agency Department of Design and Construction

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

Contact Person Norma Negrón Title MWBE Liaison & Compliance Analyst

Telephone # (718) 391-1502 Email negronn@ddc.nyc.gov

Project Description (attach additional pages if necessary)

This Project consists of the fit-out of approximately 15,000 SF of existing raw space on the ground, mezzanine and second floors of the Archstone Clinton building with two 99-seat rental theatre spaces and ancillary programs including dressing rooms, prop shops, storage, control booths and offices. The existing Archstone Clinton building was completed in 2008 by Fox Fowle and is LEED Certified. Archstone Clinton provides approximately 50,000 SF of cultural space to be shared by three theatre companies – 52nd Street Theatre, A.R.T./New York and MCC Theatres.

M/WBE Participation Goals for Services

Enter the percentage amount for each group or for an unspecified goal. Please note that there are no goals for Asian Americans in Professional Services

Prime Contract Industry: Construction

Group	Percentage
<u>Unspecified</u>	<u>10 %</u>
or	
<u>Black American</u>	<u>Unspecified %</u>
<u>Hispanic American</u>	<u>Unspecified %</u>
<u>Asian American</u>	<u>Unspecified %</u>
<u>Women</u>	<u>Unspecified %</u>
Total Participation Goals	10 %

Line 1

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Tax ID #: _____

APT E-
PIN#: 85013B0122

Contract # 2 - Plumbing Work

SCHEDULE B - M/WBE Utilization Plan

Part I: M/WBE Participation Goals

Part I to be completed by contracting agency

Contract Overview

APT E-Pin # 85013B0122 FMS Project ID#: PV467ANYC

Project Title/Agency Archstone Clinton Theater Fit-Out for the Alliance of Resident Theatres/ New York

PIN # 8502013PV0023C

Bid/Proposal Response Date: THURSDAY, NOVEMBER 14, 2013

Contracting Agency Department of Design and Construction

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

Contact Person Norma Negrón Title MWBE Liaison & Compliance Analyst

Telephone # (718) 391-1502 Email negronn@ddc.nyc.gov

Project Description (attach additional pages if necessary)

This Project consists of the fit-out of approximately 15,000 SF of existing raw space on the ground, mezzanine and second floors of the Archstone Clinton building with two 99-seat rental theatre spaces and ancillary programs including dressing rooms, prop shops, storage, control booths and offices. The existing Archstone Clinton building was completed in 2008 by Fox Fowle and is LEED Certified. Archstone Clinton provides approximately 50,000 SF of cultural space to be shared by three theatre companies – 52nd Street Theatre, A.R.T./New York and MCC Theatres.

M/WBE Participation Goals for Services

Enter the percentage amount for each group or for an unspecified goal. Please note that there are no goals for Asian Americans in Professional Services.

Prime Contract Industry: Construction

Group	Percentage	
<u>Unspecified</u>	<u>20</u>	<u>%</u>
or		
Black American	<u>Unspecified</u>	<u>%</u>
Hispanic American	<u>Unspecified</u>	<u>%</u>
Asian American	<u>Unspecified</u>	<u>%</u>
Women	<u>Unspecified</u>	<u>%</u>
Total Participation Goals	20	%

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Tax ID #: _____

APT E-
PIN#: 85013B0123

Contract # 3 - HVAC Work

SCHEDULE B - M/WBE Utilization Plan

Part I: M/WBE Participation Goals

Part I to be completed by contracting agency

Contract Overview

APT E-Pin # 85013B0123 FMS Project ID#: PV467ANYC

Project Title/Agency Archstone Clinton Theater Fit-Out for the Alliance of Resident Theatres/ New York

PIN # 8502013PV0023C

Bid/Proposal Response Date: THURSDAY, NOVEMBER 14, 2013

Contracting Agency Department of Design and Construction

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

Contact Person Norma Negrón Title MWBE Liaison & Compliance Analyst

Telephone # (718) 391-1502 Email negronn@ddc.nyc.gov

Project Description (attach additional pages if necessary)

This Project consists of the fit-out of approximately 15,000 SF of existing raw space on the ground, mezzanine and second floors of the Archstone Clinton building with two 99-seat rental theatre spaces and ancillary programs including dressing rooms, prop shops, storage, control booths and offices. The existing Archstone Clinton building was completed in 2008 by Fox Fowle and is LEED Certified. Archstone Clinton provides approximately 50,000 SF of cultural space to be shared by three theatre companies – 52nd Street Theatre, A.R.T./New York and MCC Theatres.

M/WBE Participation Goals for Services

Enter the percentage amount for each group or for an unspecified goal. Please note that there are no goals for Asian Americans in Professional Services.

Prime Contract Industry: Construction

Group	Percentage
<u>Unspecified</u>	<u>20 %</u>
or	
<u>Black American</u>	<u>Unspecified %</u>
<u>Hispanic American</u>	<u>Unspecified %</u>
<u>Asian American</u>	<u>Unspecified %</u>
<u>Women</u>	<u>Unspecified %</u>
Total Participation Goals	20 %

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Tax ID #: _____

APT E-
PIN#: 85013B0124

Contract # 4 - Electrical Work

SCHEDULE B - M/WBE Utilization Plan

Part I: M/WBE Participation Goals

Part I to be completed by contracting agency

Contract Overview

APT E-Pin # 85013B0124 FMS Project ID#: PV467ANYC

Project Title/Agency Archstone Clinton Theater Fit-Out for the Alliance of Resident Theatres/ New York

PIN # 8502013PV0023C

Bid/Proposal
Response Date: THURSDAY, NOVEMBER 14, 2013

Contracting Agency Department of Design and Construction

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

Contact Person Norma Negrón Title MWBE Liaison & Compliance Analyst

Telephone # (718) 391-1502 Email negronn@ddc.nyc.gov

Project Description (attach additional pages if necessary)

This Project consists of the fit-out of approximately 15,000 SF of existing raw space on the ground, mezzanine and second floors of the Archstone Clinton building with two 99-seat rental theatre spaces and ancillary programs including dressing rooms, prop shops, storage, control booths and offices. The existing Archstone Clinton building was completed in 2008 by Fox Fowle and is LEED Certified. Archstone Clinton provides approximately 50,000 SF of cultural space to be shared by three theatre companies – 52nd Street Theatre, A.R.T./New York and MCC Theatres.

M/WBE Participation Goals for Services

Enter the percentage amount for each group or for an unspecified goal. Please note that there are no goals for Asian Americans in Professional Service

Prime Contract Industry: Construction

Group	Percentage
<u>Unspecified</u>	<u>10 %</u>
OR	
<u>Black American</u>	<u>Unspecified %</u>
<u>Hispanic American</u>	<u>Unspecified %</u>
<u>Asian American</u>	<u>Unspecified %</u>
<u>Women</u>	<u>Unspecified %</u>
Total Participation Goals	10 %

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Tax ID #: _____

APT E-

PIN#: 85013B0121

Contract #1 - General Construction Work

SCHEDULE B - Part II: M/WBE Participation Plan

Part II to be completed by the bidder/proposer:

Please note: For Non-M/WBE Prime Contractors who will NOT subcontract any services and will self-perform the entire contract, you must obtain a FULL waiver by completing the Waiver Application on pages 9 and 9a and timely submitting it to the contracting agency pursuant to the Notice to Prospective Contractors. Once a FULL WAIVER is granted, it must be included with your bid or proposal and you do not have to complete or submit this form with your bid or proposal.

Section I: Prime Contractor Contact Information	
Tax ID # _____	FMS Vendor ID # _____
Business Name _____	Contact Person _____
Address _____	
Telephone # _____	Email _____

Section II: M/WBE Utilization: Goal Calculation: Check the applicable box and complete subsection.

PRIME CONTRACTOR ADOPTING AGENCY M/WBE PARTICIPATION GOALS				
<input type="checkbox"/> For Prime Contractors (including Qualified Joint Ventures and M/WBE firms) adopting Agency M/WBE Participation Goals. Calculate the total dollar value of your total bid that you agree will be awarded to M/WBE subcontractors for services and/or credited to an M/WBE prime contractor or qualified Joint Venture. Please review the Notice to Prospective Contractors for more information on how to obtain credit for M/WBE participation.	Total Bid/Proposal Value		Agency Total Participation Goals (Line 1, Page 1)	Calculated M/WBE Participation Amount
\$		X		= \$ Line 2

PRIME CONTRACTOR OBTAINED PARTIAL WAIVER APPROVAL: ADOPTING MODIFIED M/WBE PARTICIPATION GOALS				
<input type="checkbox"/> For Prime Contractors (including Qualified Joint Ventures and M/WBE firms) adopting Modified M/WBE Participation Goals. Calculate the total dollar value of your total bid that you agree will be awarded to M/WBE subcontractors for services and/or credited to an M/WBE prime contractor or Qualified Joint Venture. Please review the Notice to Prospective Contractors for more information on how to obtain credit for M/WBE participation.	Total Bid/Proposal Value		Adjusted Participation Goal (From Partial Waiver)	Calculated M/WBE Participation Amount
\$		X		= \$ Line 3

Section III: M/WBE Utilization Plan: How Proposer/Bidder Will Fulfill M/WBE Participation Goals. Please review the Notice to Prospective Contractors for more information on how to obtain credit for M/WBE participation. Check applicable box. The Proposer or Bidder will fulfill the M/WBE Participation Goals:

As an M/WBE Prime Contractor that will self-perform and/or subcontract to other M/WBE firms a portion of the contract the value of which is at least the amount located on Lines 2 or 3 above, as applicable. The value of any work subcontracted to non-M/WBE firms will not be credited towards fulfillment of M/WBE Participation Goals. Please check all that apply to Prime Contractor:
 MBE WBE

As a Qualified Joint Venture with an M/WBE partner, in which the value of the M/WBE partner's participation and/or the value of any work subcontracted to other M/WBE firms is at least the amount located on Lines 2 or 3 above, as applicable. The value of any work subcontracted to non M/WBE firms will not be credited towards fulfillment of M/WBE Participation Goals.

As a non M/WBE Prime Contractor that will enter into subcontracts with M/WBE firms the value of which is at least the amount located on Lines 2 or 3 above, as applicable.

Section IV: General Contract Information

What is the expected percentage of the total contract dollar value that you expect to award in subcontracts for services, regardless of M/WBE status? % _____

Enter brief description of the type(s) and dollar value of subcontracts for all any services you plan on subcontracting if awarded this contract. For each item, indicate whether the work is designated for participation by MBEs and/or WBEs and the time frame in which such work is scheduled to begin and end. Use additional sheets if necessary.

✓ **Scopes of Subcontract Work**

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Section V: Vendor Certification and Required Affirmations

I hereby:
1) acknowledge my understanding of the M/WBE participation requirements as set forth herein and the pertinent provisions of Section 6-129 of the Administrative Code of the City of New York (Section 6-129), and the rules promulgated thereunder;
2) affirm that the information supplied in support of this M/WBE Utilization Plan is true and correct;
3) agree, if awarded this Contract, to comply with the M/WBE participation requirements of this Contract, the pertinent provisions of Section 6-129, and the rules promulgated thereunder, all of which shall be deemed to be material terms of this Contract
4) agree and affirm that it is a material term of this Contract that the Vendor will award the total dollar value of the M/WBE Participation Goals to certified MBEs and/or WBEs, unless a full waiver is obtained or such goals are modified by the Agency; and
5) agree and affirm, if awarded this Contract, to make all reasonable, good faith efforts to meet the M/WBE Participation Goals, or if a partial waiver is obtained or such goals are modified by the Agency, to meet the modified Participation Goals by soliciting and obtaining the participation of certified MBE and/or WBE firms.

Signature _____
Print Name _____

Date _____
Title _____

Tax ID #: _____

APT E-

PIN#:

85013B0122

Contract #2 - Plumbing Work

SCHEDULE B - Part II: M/WBE Participation Plan

Part II to be completed by the bidder/proposer:

Case note: For Non-M/WBE Prime Contractors who will NOT subcontract any services and will self-perform the entire contract, you must obtain a FULL waiver by completing the Waiver Application on pages 9 and 9a and timely submitting it to the contracting agency pursuant to the Notice to Prospective Contractors. Once a FULL WAIVER is granted, it must be included with your bid or proposal and you do not have to complete or submit this form with your bid or proposal.

Section I: Prime Contractor Contact Information	
Tax ID # _____	FMS Vendor ID # _____
Business Name _____	Contact Person _____
Address _____	
Telephone # _____	Email _____

Section II: M/WBE Utilization Goal Calculation: Check the applicable box and complete subsection.

PRIME CONTRACTOR ADOPTING AGENCY M/WBE PARTICIPATION GOALS				
<input type="checkbox"/> For Prime Contractors (including Qualified Joint Ventures and M/WBE firms) adopting Agency M/WBE Participation Goals.	Total Bid/Proposal Value	Agency Total Participation Goals (Line 1, Page 1)		Calculated M/WBE Participation Amount
<p>Calculate the total dollar value of your total bid that you agree will be awarded to M/WBE subcontractors for services and/or credited to an M/WBE prime contractor or Qualified Joint Venture.</p> <p>Please review the Notice to Prospective Contractors for more information on how to obtain credit for M/WBE participation.</p>	\$	X	=	\$ Line 2

PRIME CONTRACTOR OBTAINED PARTIAL WAIVER APPROVAL: ADOPTING MODIFIED M/WBE PARTICIPATION GOALS				
<input type="checkbox"/> For Prime Contractors (including Qualified Joint Ventures and M/WBE firms) adopting Modified M/WBE Participation Goals.	Total Bid/Proposal Value	Adjusted Participation Goal (From Partial Waiver)		Calculated M/WBE Participation Amount
<p>Calculate the total dollar value of your total bid that you agree will be awarded to M/WBE subcontractors for services and/or credited to an M/WBE prime contractor or Qualified Joint Venture.</p> <p>Please review the Notice to Prospective Contractors for more information on how to obtain credit for M/WBE participation.</p>	\$	X	=	\$ Line 3

Section III: M/WBE Utilization Plan: How Proposer/Bidder Will Fulfill M/WBE Participation Goals. Please review the Notice to Prospective Contractors for more information on how to obtain credit for M/WBE participation. Check applicable box. The Proposer or Bidder will fulfill the M/WBE Participation Goals:

As an M/WBE Prime Contractor that will self-perform and/or subcontract to other M/WBE firms a portion of the contract the value of which is at least the amount located on Lines 2 or 3 above, as applicable. The value of any work subcontracted to non-M/WBE firms will not be credited towards fulfillment of M/WBE Participation Goals. Please check all that apply to Prime Contractor:

MBE WBE

As a Qualified Joint Venture with an M/WBE partner, in which the value of the M/WBE partner's participation and/or the value of any work subcontracted to other M/WBE firms is at least the amount located on Lines 2 or 3 above, as applicable. The value of any work subcontracted to non M/WBE firms will not be credited towards fulfillment of M/WBE Participation Goals.

As a non M/WBE Prime Contractor that will enter into subcontracts with M/WBE firms the value of which is at least the amount located on Lines 2 or 3 above, as applicable.

Section IV: General Contract Information

What is the expected percentage of the total contract dollar value that you expect to award in subcontracts for services, regardless of M/WBE status? % _____

Enter brief description of the type(s) and dollar value of subcontracts for all any services you plan on subcontracting if awarded this contract. For each item, indicate whether the work is designated for participation by MBEs and/or WBEs and the time frame in which such work is scheduled to begin and end. Use additional sheets if necessary.

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- 15. _____
- 16. _____
- 17. _____

✓ **Scopes of Subcontract Work**

Section V: Vendor Certification and Required Affirmations

I hereby:

- 1) acknowledge my understanding of the M/WBE participation requirements as set forth herein and the pertinent provisions of Section 6-129 of the Administrative Code of the City of New York (Section 6-129), and the rules promulgated thereunder;
- 2) affirm that the information supplied in support of this M/WBE Utilization Plan is true and correct;
- 3) agree, if awarded this Contract, to comply with the M/WBE participation requirements of this Contract, the pertinent provisions of Section 6-129, and the rules promulgated thereunder, all of which shall be deemed to be material terms of this Contract
- 4) agree and affirm that it is a material term of this Contract that the Vendor will award the total dollar value of the M/WBE Participation Goals to certified MBEs and/or WBEs, unless a full waiver is obtained or such goals are modified by the Agency; and
- 5) agree and affirm, if awarded this Contract, to make all reasonable, good faith efforts to meet the M/WBE Participation Goals, or if a partial waiver is obtained or such goals are modified by the Agency, to meet the modified Participation Goals by soliciting and obtaining the participation of certified MBE and/or WBE firms.

Signature _____

Date _____

Print Name _____

Title _____

Tax ID #: _____

APT E-

PIN#: 85013B0123

Contract #3 - HVAC Work

SCHEDULE B - Part II: M/WBE Participation Plan

Part II to be completed by the bidder/proposer:

Case note: For Non-M/WBE Prime Contractors who will NOT subcontract any services and will self-perform the entire contract, you must obtain a FULL waiver by completing the Waiver Application on pages 9 and 9a and timely submitting it to the contracting agency pursuant to the Notice to Prospective Contractors. Once a FULL WAIVER is granted, it must be included with your bid or proposal and you do not have to complete or submit this form with your bid or proposal.

Section I: Prime Contractor Contact Information	
Tax ID # _____	FMS Vendor ID # _____
Business Name _____	Contact Person _____
Address _____	
Telephone # _____	Email _____

Section II: M/WBE Utilization Goal Calculation: Check the applicable box and complete subsection.

PRIME CONTRACTOR ADOPTING AGENCY M/WBE PARTICIPATION GOALS					
<input type="checkbox"/> For Prime Contractors (including Qualified Joint Ventures and M/WBE firms) adopting Agency M/WBE Participation Goals. Calculate the total dollar value of your total bid that you agree will be awarded to M/WBE subcontractors for services and/or credited to an M/WBE prime contractor or qualified Joint Venture. Please review the Notice to Prospective Contractors for more information on how to obtain credit for M/WBE participation.	Total Bid/Proposal Value		Agency Total Participation Goals (Line 1, Page 1)		Calculated M/WBE Participation Amount
	\$	X		=	\$ Line 2

PRIME CONTRACTOR OBTAINED PARTIAL WAIVER APPROVAL: ADOPTING MODIFIED M/WBE PARTICIPATION GOALS					
<input type="checkbox"/> For Prime Contractors (including Qualified Joint Ventures and M/WBE firms) adopting Modified M/WBE Participation Goals. Calculate the total dollar value of your total bid that you agree will be awarded to M/WBE subcontractors for services and/or credited to an M/WBE prime contractor or Qualified Joint Venture. Please review the Notice to Prospective Contractors for more information on how to obtain credit for M/WBE participation.	Total Bid/Proposal Value		Adjusted Participation Goal (From Partial Waiver)		Calculated M/WBE Participation Amount
	\$	X		=	\$ Line 3

Section III: M/WBE Utilization Plan: How Proposer/Bidder Will Fulfill M/WBE Participation Goals. Please review the Notice to Prospective Contractors for more information on how to obtain credit for M/WBE participation. Check applicable box. The Proposer or Bidder will fulfill the M/WBE Participation Goals:

As an M/WBE Prime Contractor that will self-perform and/or subcontract to other M/WBE firms a portion of the contract the value of which is at least the amount located on Lines 2 or 3 above, as applicable. The value of any work subcontracted to non-M/WBE firms will not be credited towards fulfillment of M/WBE Participation Goals. Please check all that apply to Prime Contractor:

MBE WBE

As a Qualified Joint Venture with an M/WBE partner, in which the value of the M/WBE partner's participation and/or the value of any work subcontracted to other M/WBE firms is at least the amount located on Lines 2 or 3 above, as applicable. The value of any work subcontracted to non M/WBE firms will not be credited towards fulfillment of M/WBE Participation Goals.

As a non M/WBE Prime Contractor that will enter into subcontracts with M/WBE firms the value of which is at least the amount located on Lines 2 or 3 above, as applicable.

Section IV: General Contract Information

What is the expected percentage of the total contract dollar value that you expect to award in subcontracts for services, regardless of M/WBE status? % _____

Enter brief description of the type(s) and dollar value of subcontracts for all any services you plan on subcontracting if awarded this contract. For each item, indicate whether the work is designated for participation by MBEs and/or WBEs and the time frame in which such work is scheduled to begin and end. Use additional sheets if necessary.

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✓ **Scopes of Subcontract Work**

Section V: Vendor Certification and Required Affirmations

I hereby:

- 1) acknowledge my understanding of the M/WBE participation requirements as set forth herein and the pertinent provisions of Section 6-129 of the Administrative Code of the City of New York (Section 6-129), and the rules promulgated thereunder;
- 2) affirm that the information supplied in support of this M/WBE Utilization Plan is true and correct;
- 3) agree, if awarded this Contract, to comply with the M/WBE participation requirements of this Contract, the pertinent provisions of Section 6-129, and the rules promulgated thereunder, all of which shall be deemed to be material terms of this Contract
- 4) agree and affirm that it is a material term of this Contract that the Vendor will award the total dollar value of the M/WBE Participation Goals to certified MBEs and/or WBEs, unless a full waiver is obtained or such goals are modified by the Agency; and
- 5) agree and affirm, if awarded this Contract, to make all reasonable, good faith efforts to meet the M/WBE Participation Goals, or if a partial waiver is obtained or such goals are modified by the Agency, to meet the modified Participation Goals by soliciting and obtaining the participation of certified MBE and/or WBE firms.

Signature _____

Date _____

Print Name _____

Title _____

Tax ID #: _____

APT E-

PIN#: 85013B0124

Contract #4 - Electrical Work

SCHEDULE B - Part II: M/WBE Participation Plan

Part II to be completed by the bidder/proposer:

Case note: For Non-M/WBE Prime Contractors who will NOT subcontract any services and will self-perform the entire contract, you must obtain a FULL waiver by completing the Waiver Application on pages 9 and 9a and timely submitting it to the contracting agency pursuant to the Notice to Prospective Contractors. Once a FULL WAIVER is granted, it must be included with your bid or proposal and you do not have to complete or submit this form with your bid or proposal.

Section I: Prime Contractor Contact Information

Tax ID # _____	FMS Vendor ID # _____
Business Name _____	Contact Person _____
Address _____	
Telephone # _____	Email _____

Section II: M/WBE Utilization Goal Calculation: Check the applicable box and complete subsection.

PRIME CONTRACTOR ADOPTING AGENCY M/WBE PARTICIPATION GOALS

<input type="checkbox"/> For Prime Contractors (including Qualified Joint Ventures and M/WBE firms) adopting Agency M/WBE Participation Goals. Calculate the total dollar value of your total bid that you agree will be awarded to M/WBE subcontractors for services and/or credited to an M/WBE prime contractor or Qualified Joint Venture. Please review the Notice to Prospective Contractors for more information on how to obtain credit for M/WBE participation.	Total Bid/Proposal Value	Agency Total Participation Goals (Line 1, Page 1)		Calculated M/WBE Participation Amount
	\$ _____	X _____	= _____	\$ _____ Line 2

PRIME CONTRACTOR OBTAINED PARTIAL WAIVER APPROVAL: ADOPTING MODIFIED M/WBE PARTICIPATION GOALS

<input type="checkbox"/> For Prime Contractors (including Qualified Joint Ventures and M/WBE firms) adopting Modified M/WBE Participation Goals. Calculate the total dollar value of your total bid that you agree will be awarded to M/WBE subcontractors for services and/or credited to an M/WBE prime contractor or Qualified Joint Venture. Please review the Notice to Prospective Contractors for more information on how to obtain credit for M/WBE participation.	Total Bid/Proposal Value	Adjusted Participation Goal (From Partial Waiver)		Calculated M/WBE Participation Amount
	\$ _____	X _____	= _____	\$ _____ Line 3

Section III: M/WBE Utilization Plan: How Proposer/Bidder Will Fulfill M/WBE Participation Goals. Please review the Notice to Prospective Contractors for more information on how to obtain credit for M/WBE participation. Check applicable box. The Proposer or Bidder will fulfill the M/WBE Participation Goals:

As an M/WBE Prime Contractor that will self-perform and/or subcontract to other M/WBE firms a portion of the contract the value of which is at least the amount located on Lines 2 or 3 above, as applicable. The value of any work subcontracted to non-M/WBE firms will not be credited towards fulfillment of M/WBE Participation Goals. Please check all that apply to Prime Contractor:

MBE WBE

As a Qualified Joint Venture with an M/WBE partner, in which the value of the M/WBE partner's participation and/or the value of any work subcontracted to other M/WBE firms is at least the amount located on Lines 2 or 3 above, as applicable. The value of any work subcontracted to non M/WBE firms will not be credited towards fulfillment of M/WBE Participation Goals.

As a non M/WBE Prime Contractor that will enter into subcontracts with M/WBE firms the value of which is at least the amount located on Lines 2 or 3 above, as applicable.

Section IV: General Contract Information

What is the expected percentage of the total contract dollar value that you expect to award in subcontracts for services, regardless of M/WBE status? % _____

Enter brief description of the type(s) and dollar value of subcontracts for all any services you plan on subcontracting if awarded this contract. For each item, indicate whether the work is designated for participation by MBEs and/or WBEs and the time frame in which such work is scheduled to begin and end. Use additional sheets if necessary.

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✓ **Scopes of Subcontract Work**

Section V: Vendor Certification and Required Affirmations

- I hereby:
- 1) acknowledge my understanding of the M/WBE participation requirements as set forth herein and the pertinent provisions of Section 6-129 of the Administrative Code of the City of New York (Section 6-129), and the rules promulgated thereunder;
 - 2) affirm that the information supplied in support of this M/WBE Utilization Plan is true and correct;
 - 3) agree, if awarded this Contract, to comply with the M/WBE participation requirements of this Contract, the pertinent provisions of Section 6-129, and the rules promulgated thereunder, all of which shall be deemed to be material terms of this Contract
 - 4) agree and affirm that it is a material term of this Contract that the Vendor will award the total dollar value of the M/WBE Participation Goals to certified MBEs and/or WBEs, unless a full waiver is obtained or such goals are modified by the Agency; and
 - 5) agree and affirm, if awarded this Contract, to make all reasonable, good faith efforts to meet the M/WBE Participation Goals, or if a partial waiver is obtained or such goals are modified by the Agency, to meet the modified Participation Goals by soliciting and obtaining the participation of certified MBE and/or WBE firms.

Signature _____

Date _____

Print Name _____

Title _____

SCHEDULE B – PART III – REQUEST FOR WAIVER OF M/WBE PARTICIPATION REQUIREMENT

Contract Overview

Tax ID # _____ FMS Vendor ID # _____

Business Name _____

Contact Name _____ Telephone # _____ Email _____

Type of Procurement Competitive Sealed Bids Other Bid/Response Due Date _____

APT E-PIN # (for this procurement): _____ Contracting Agency: _____

M/WBE Participation Goals as described in bid/solicitation documents

_____ % Agency M/WBE Participation Goal

Proposed M/WBE Participation Goal as anticipated by vendor seeking waiver

_____ % of the total contract value anticipated in good faith by the bidder/proposer to be subcontracted for services and/or credited to an M/WBE Prime Contractor or Qualified Joint Venture.

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

- Vendor does not subcontract services, and has the capacity and good faith intention to perform all such work itself with its own employees.
- Vendor subcontracts *some* of this type of work but at a *lower* % than bid/solicitation describes, and has the capacity and good faith intention to do so on this contract. (Attach subcontracting plan outlining services that the vendor will self-perform and subcontract to other vendors or consultants.)
- Vendor has other legitimate business reasons for proposing the M/WBE Participation Goal above. Explain under separate cover.

References
List 3 most recent contracts performed for NYC agencies (if any). Include information for each subcontract awarded in performance of such contracts. Add more pages if necessary.

CONTRACT NO.	AGENCY	DATE COMPLETED
Total Contract Amount \$ _____	Total Amount Subcontracted \$ _____	
Item of Work Subcontracted and Value of subcontract _____	Item of Work Subcontracted and Value of subcontract _____	Item of Work Subcontracted and Value of subcontract _____
CONTRACT NO. _____	AGENCY _____	DATE COMPLETED _____
Total Contract Amount \$ _____	Total Amount Subcontracted \$ _____	
Item of Work Subcontracted and Value of subcontract _____	Item of Work Subcontracted and Value of subcontract _____	Item of Work Subcontracted and Value of subcontract _____
CONTRACT NO. _____	AGENCY _____	DATE COMPLETED _____
Total Contract Amount \$ _____	Total Amount Subcontracted \$ _____	
Item of Work Subcontracted and Value of subcontract _____	Item of Work Subcontracted and Value of subcontract _____	Item of Work Subcontracted and Value of subcontract _____

List 3 most recent contracts performed for other entities. Include information for each subcontract awarded in performance of such contracts. Add more pages if necessary.

(Complete ONLY if vendor has performed fewer than 3 New York City contracts.)

TYPE OF Contract _____ ENTITY _____ DATE COMPLETED _____
 Manager at entity that hired vendor (Name/Phone No./Email) _____
 Total Contract Amount \$ _____ Total Amount Subcontracted \$ _____
 Type of Work Subcontracted _____

TYPE OF Contract _____ AGENCY/ENTITY _____ DATE COMPLETED _____
 Manager at agency/entity that hired vendor (Name/Phone No./Email) _____
 Total Contract Amount \$ _____ Total Amount Subcontracted \$ _____
 Item of Work Subcontracted and Value of subcontract _____ Item of Work Subcontracted and Value of subcontract _____

TYPE OF Contract _____ AGENCY/ENTITY _____ DATE COMPLETED _____
 Manager at entity that hired vendor (Name/Phone No./Email) _____
 Total Contract Amount \$ _____ Total Amount Subcontracted \$ _____
 Item of Work Subcontracted and Value of subcontract _____ Item of Work Subcontracted and Value of subcontract _____

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

Signature: _____ Date: _____
 Print Name: _____ Title: _____

Shaded area below is for agency completion only

AGENCY CHIEF CONTRACTING OFFICER APPROVAL
 Signature: _____ Date: _____

CITY CHIEF PROCUREMENT OFFICER APPROVAL
 Signature: _____ Date: _____

Waiver Determination
 Full Waiver Approved:
 Waiver Denied:
 Partial Waiver Approved:
 Revised Participation Goal: _____ %

APPRENTICESHIP PROGRAM REQUIREMENTS

Bidders are advised that the Apprenticeship Program Requirements set forth below apply to each contract for which a check mark is indicated before the word "Yes". Compliance with these requirements will be determined solely by the City.

General Construction	<u> x </u>	YES	<u> </u>	NO
		* Note: Even if Yes is marked, the Exemption set forth below may apply.		
Plumbing Work		YES	<u> x </u>	NO
HVAC + Fire Protection Work	<u> x </u>	YES		NO
Electrical Work	<u> x </u>	YES		NO

1) Apprenticeship Program Requirements

NOTICE TO BIDDERS: Please be advised that, pursuant to the authority granted to the City under Labor Law Section 816-b, the Department of Design and Construction hereby requires that the contractor awarded a contract as a result of this Invitation for Bids, and any of its subcontractors with subcontracts worth one million dollars or over, have, prior to entering into such contract or subcontract, apprenticeship agreements appropriate for the type and scope of work to be performed that have been registered with, and approved by, the New York State Commissioner of Labor. In addition, the contractor and its subcontractors will be required to show that such apprenticeship programs have three years of current, successful experience in providing career opportunities.

The failure to prove, upon request, that these requirements have been met shall result in the contract not being awarded to the contractor or the subcontract not being approved.

Please be further advised that, pursuant to Labor Law Section 220, the allowable ratio of apprentices to journeymen in any craft classification shall not be greater than the ratio permitted to the contractor as to its workforce on any job under the registered apprenticeship program.

2) Apprenticeship Program Questionnaire

The bidder must submit a completed and signed Apprenticeship Program Questionnaire, unless it qualifies for the exemption set forth below. The Questionnaire is set forth on the following page of the Bid Booklet.

3) Exemption

Bidders for the General Construction Contract are advised that the exemption set forth below applies if an "X" is indicated before the word "Yes".

<u> </u>	YES	<u> x </u>	NO
-----------------	-----	--------------	----

Exemption: If the bidder intends to subcontract 100% of the construction work, it is not required to demonstrate that it has an Apprenticeship Agreement(s), nor is it required to submit an Apprenticeship Program Questionnaire. If the bidder qualifies for this exemption, it shall submit a letter stating that it intends to subcontract 100% of the construction work. As indicated above, the Apprenticeship Program Requirements apply to subcontracts worth one million dollars or more.

APPRENTICESHIP PROGRAM QUESTIONNAIRE

PROJECT ID: PV467ANYC

The bidder must submit a completed and signed Apprenticeship Program Questionnaire unless it qualifies for the exemption set forth on the previous page.

Name of Bidder: _____

1) Does the bidder have an Apprenticeship Program appropriate for the type and scope of work to be performed?
[Note: Participation may be by either direct sponsorship or through collective bargaining agreement(s).]

_____ YES _____ NO

2) Has the bidder's Apprenticeship Program been registered with, and approved by, the New York State Commissioner of Labor?

_____ YES _____ NO

3) Has the bidder's Apprenticeship Program had three years of successful experience in providing career opportunities?

_____ YES _____ NO

If the answer to Question #3 is "Yes", the bidder shall, in the space below, provide information regarding the experience the Apprenticeship Program has had in providing career opportunities. The bidder may attach additional pages if necessary.

Bidder: _____

By: _____
(Signature of Partner or Corporate Officer)

Title: _____

Date: _____

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

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

PROJECT ID: PV467ANYC

**Archstone Clinton Theater Fit-Out for the Alliance of Resident Theatres/
New York
502 West 53rd Street
New York, NY 10019**

Name of Bidder: _____

Date of Bid Opening: _____

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

Place of Business of Bidder: _____

Bidder's Telephone Number: _____ Bidder's Fax Number: _____

Bidder's Email Address: _____

Residence of Bidder (If Individual): _____

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

Names of Partners

Residence of Partners

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

Organized under the laws of the State of _____

Name and Home Address of President: _____

Name and Home Address of Secretary: _____

Name and Home Address of Treasurer: _____

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BID FORM

The above-named Bidder affirms and declares:

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

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

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

6. Compliance Report

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

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

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

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

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

BID FORM

PROJECT ID: PV467ANYC
Contract #1 - General Construction Work

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

A. LUMP SUM PRICE - Total price for all labor and material for all required work, excluding item (B) set forth below. Total Price shall include all costs and expenses, i.e. labor, material overhead and profit for all the Work, described and shown in the drawings and specifications.

Total Price For Labor

Total Price for Material Sold and Delivered

\$ _____ + \$ _____ Total Price for Item A= \$ _____

B. ALLOWANCE for Incidental Asbestos Abatement (Section 028013 of the Specifications) \$15,000.00

TOTAL BID PRICE (Add A + B) (a/k/a BID PROPOSAL) \$ _____

BIDDER'S SIGNATURE AND AFFIDAVIT

* M/WBE UTILIZATION PLAN: By signing its bid in the space below, the bidder agrees to the Vendor Certification and Required Affirmations set forth below, unless a full waiver of the Participation Goals is granted. The Vendor Certification and Required Affirmations will be deemed to satisfy the requirement to complete Section V of Part II of Schedule B: M/WBE Utilization Plan.

Section V: Vendor Certification and Required Affirmations: I hereby: 1) acknowledge my understanding of the M/WBE participation requirements as set forth in this Contract and the pertinent provisions of Section 6-129 of the Administrative Code of the City of New York ("Section 6-129"), and the rules promulgated thereunder; 2) affirm that the information supplied in support of the M/WBE Utilization Plan is true and correct; 3) agree, if awarded this Contract, to comply with the M/WBE participation requirements of this Contract, the pertinent provisions of Section 6-129, and the rules promulgated thereunder, all of which shall be deemed to be material terms of this Contract; 4) agree and affirm that it is a material term of this Contract that the Vendor will award the total dollar value of the M/WBE Participation Goals to certified MBEs and/or WBEs, unless a full waiver is obtained or such goals are modified by the Agency; and 5) agree and affirm, if awarded this Contract, to make all reasonable, good faith efforts to meet the M/WBE Participation Goals, or If a partial waiver is obtained or such goals are modified by the Agency, to meet the modified Participation Goals by soliciting and obtaining the participation of certified MBE and/or WBE firms.

Bidder: _____

By: _____ (Signature of Partner or corporate officer)

Attest: _____ Secretary of Corporate Bidder (Corporate Seal)

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

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BID FORM

PROJECT ID: PV467ANYC
Contract #2 - Plumbing Work

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

A. LUMP SUM PRICE - Total price for all labor and material for all required work, excluding item (B) set forth below. Total Price shall include all costs and expenses, i.e. labor, material overhead and profit for all the Work, described and shown in the drawings and specifications.

Total Price For Labor

Total Price for Material Sold and Delivered

\$ _____ + \$ _____ Total Price for Item A= \$ _____

B. ALLOWANCE for Incidental Asbestos Abatement (Section 220013 of the Specifications) \$15,000.00

TOTAL BID PRICE (Add A + B) (a/k/a BID PROPOSAL) \$ _____

BIDDER'S SIGNATURE AND AFFIDAVIT

* M/WBE UTILIZATION PLAN: By signing its bid in the space below, the bidder agrees to the Vendor Certification and Required Affirmations set forth below, unless a full waiver of the Participation Goals is granted. The Vendor Certification and Required Affirmations will be deemed to satisfy the requirement to complete Section V of Part II of Schedule B: M/WBE Utilization Plan.

Section V: Vendor Certification and Required Affirmations: I hereby: 1) acknowledge my understanding of the M/WBE participation requirements as set forth in this Contract and the pertinent provisions of Section 6-129 of the Administrative Code of the City of New York ("Section 6-129"), and the rules promulgated thereunder; 2) affirm that the information supplied in support of the M/WBE Utilization Plan is true and correct; 3) agree, if awarded this Contract, to comply with the M/WBE participation requirements of this Contract, the pertinent provisions of Section 6-129, and the rules promulgated thereunder, all of which shall be deemed to be material terms of this Contract; 4) agree and affirm that it is a material term of this Contract that the Vendor will award the total dollar value of the M/WBE Participation Goals to certified MBEs and/or WBEs, unless a full waiver is obtained or such goals are modified by the Agency; and 5) agree and affirm, if awarded this Contract, to make all reasonable, good faith efforts to meet the M/WBE Participation Goals, or If a partial waiver is obtained or such goals are modified by the Agency, to meet the modified Participation Goals by soliciting and obtaining the participation of certified MBE and/or WBE firms.

Bidder: _____

By: _____ (Signature of Partner or corporate officer)

Attest: _____ Secretary of Corporate Bidder (Corporate Seal)

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

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BID FORM

PROJECT ID: PV467ANYC
Contract #3 - HVAC + Fire Protection Work

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

A. LUMP SUM PRICE - Total price for all labor and material for all required work, excluding item (B) set forth below. Total Price shall include all costs and expenses, i.e. labor, material overhead and profit for all the Work, described and shown in the drawings and specifications.

Total Price For Labor

Total Price for Material Sold and Delivered

\$ _____

+

\$ _____

Total Price for Item A= \$ _____

B. ALLOWANCE for Incidental Asbestos Abatement (Section 230013 of the Specifications)

\$15,000.00

TOTAL BID PRICE (Add A + B) (a/k/a BID PROPOSAL)

\$ _____

BIDDER'S SIGNATURE AND AFFIDAVIT

* M/WBE UTILIZATION PLAN: By signing its bid in the space below, the bidder agrees to the Vendor Certification and Required Affirmations set forth below, unless a full waiver of the Participation Goals is granted. The Vendor Certification and Required Affirmations will be deemed to satisfy the requirement to complete Section V of Part II of Schedule B: M/WBE Utilization Plan.

Section V: Vendor Certification and Required Affirmations: I hereby: 1) acknowledge my understanding of the M/WBE participation requirements as set forth in this Contract and the pertinent provisions of Section 6-129 of the Administrative Code of the City of New York ("Section 6-129"), and the rules promulgated thereunder; 2) affirm that the information supplied in support of the M/WBE Utilization Plan is true and correct; 3) agree, if awarded this Contract, to comply with the M/WBE participation requirements of this Contract, the pertinent provisions of Section 6-129, and the rules promulgated thereunder, all of which shall be deemed to be material terms of this Contract; 4) agree and affirm that it is a material term of this Contract that the Vendor will award the total dollar value of the M/WBE Participation Goals to certified MBEs and/or WBEs, unless a full waiver is obtained or such goals are modified by the Agency; and 5) agree and affirm, if awarded this Contract, to make all reasonable, good faith efforts to meet the M/WBE Participation Goals, or If a partial waiver is obtained or such goals are modified by the Agency, to meet the modified Participation Goals by soliciting and obtaining the participation of certified MBE and/or WBE firms.

Bidder: _____

By: _____

(Signature of Partner or corporate officer)

Attest: (Corporate Seal)

Secretary of Corporate Bidder

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

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BID FORM

PROJECT ID: PV467ANYC
Contract #4 - Electrical Work

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

A. LUMP SUM PRICE - Total price for all labor and material for all required work, excluding item (B) set forth below. Total Price shall include all costs and expenses, i.e. labor, material overhead and profit for all the Work, described and shown in the drawings and specifications.

Total Price For Labor

Total Price for Material Sold and Delivered

\$ _____ + \$ _____ Total Price for Item A= \$ _____

B. ALLOWANCE for Incidental Asbestos Abatement (Section 260013 of the Specifications) \$15,000.00

TOTAL BID PRICE (Add A + B) (a/k/a BID PROPOSAL) \$ _____

BIDDER'S SIGNATURE AND AFFIDAVIT

* M/WBE UTILIZATION PLAN: By signing its bid in the space below, the bidder agrees to the Vendor Certification and Required Affirmations set forth below, unless a full waiver of the Participation Goals is granted. The Vendor Certification and Required Affirmations will be deemed to satisfy the requirement to complete Section V of Part II of Schedule B: M/WBE Utilization Plan.

Section V: Vendor Certification and Required Affirmations: I hereby: 1) acknowledge my understanding of the M/WBE participation requirements as set forth in this Contract and the pertinent provisions of Section 6-129 of the Administrative Code of the City of New York ("Section 6-129"), and the rules promulgated thereunder; 2) affirm that the information supplied in support of the M/WBE Utilization Plan is true and correct; 3) agree, if awarded this Contract, to comply with the M/WBE participation requirements of this Contract, the pertinent provisions of Section 6-129, and the rules promulgated thereunder, all of which shall be deemed to be material terms of this Contract; 4) agree and affirm that it is a material term of this Contract that the Vendor will award the total dollar value of the M/WBE Participation Goals to certified MBEs and/or WBEs, unless a full waiver is obtained or such goals are modified by the Agency; and 5) agree and affirm, if awarded this Contract, to make all reasonable, good faith efforts to meet the M/WBE Participation Goals, or If a partial waiver is obtained or such goals are modified by the Agency, to meet the modified Participation Goals by soliciting and obtaining the participation of certified MBE and/or WBE firms.

Bidder: _____

By: _____ (Signature of Partner or corporate officer)

Attest: (Corporate Seal)

Secretary of Corporate Bidder

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

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BID FORM (TO BE NOTARIZED)

AFFIDAVIT WHERE BIDDERS IS AN INDIVIDUAL

STATE OF NEW YORK, COUNTY OF _____ ss:

_____ being duly sworn says:

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

(Signature of the person who signed the Bid)

Subscribed and sworn to before me this
_____ day of _____,

Notary Public

AFFIDAVIT WHERE BIDDERS IS A PARTNERSHIP

STATE OF NEW YORK, COUNTY OF _____ ss:

_____ being duly sworn says:

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

(Signature of Partner who signed the Bid)

Subscribed and sworn to before me this
_____ day of _____,

Notary Public

AFFIDAVIT WHERE BIDDERS IS A CORPORATION

STATE OF NEW YORK, COUNTY OF _____ ss:

_____ being duly sworn says:

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

(Signature of Corporate Officer who signed the Bid)

Subscribed and sworn to before me this
_____ day of _____,

Notary Public

AFFIRMATION

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

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

Full Name of Bidder: _____
Address: _____
City: _____ State: _____ Zip Code: _____

CHECK ONE BOX AND INCLUDE APPROPRIATE NUMBER:

- A - Individual or Sole Proprietorship *
SOCIAL SECURITY NUMBER

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

- C - Corporation
EMPLOYER IDENTIFICATION NUMBER

By: _____
Signature:

Title: _____

If a corporation, place seal here

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

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

BID BOND 1
FORM OF BID BOND

KNOW ALL MEN BY THESE PRESENTS. That we, _____

hereinafter referred to as the "Principal", and _____

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

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

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

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

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

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

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

BID BOND 2

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

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

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

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

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

(Seal)

Principal (L.S.)

By: _____

(Seal)

Surety

By: _____

ACKNOWLEDGEMENT OF PRINCIPAL, IF A CORPORATION

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

Notary Public

ACKNOWLEDGEMENT OF PRINCIPAL, IF A PARTNERSHIP

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

Notary Public

ACKNOWLEDGEMENT OF PRINCIPAL, IF AN INDIVIDUAL

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

Notary Public

AFFIX ACKNOWLEDGEMENTS AND JUSTIFICATION OF SURETIES

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BID BREAKDOWN

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

General Construction	<u> x </u>	YES		<u> </u>	NO
Plumbing Work	<u> x </u>	YES		<u> </u>	NO
HVAC + Fire Protection Work	<u> x </u>	YES		<u> </u>	NO
Electrical Work	<u> x </u>	YES		<u> </u>	NO

Limitations on Use of Bid Breakdown:

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

Instructions for Preparing Bid Breakdown:

- (A) The Bid Breakdown is set forth on the following pages of this Bid Booklet and is in accordance with the Construction Specification Institute (CSI) format. For all items of work listed in the Bid Breakdown, the bidder must indicate the price for labor and the price for material, as well as the estimated quantities required.
- (B) In preparing its Bid Breakdown, the bidder shall submit prices that include all costs for overhead and profit. Overhead shall include, without limitation, all costs in connection with the following: administration, management, superintendence, small tools, insurance, bonds, and provision of services or items required by the General Conditions [except for Security/Fire Guard Services and Temporary Heat]. If the Project requires Security/Fire Guard Services and/or Temporary Heat, such service(s) will be included as separate line items in the Bid Breakdown.
- (C) If an item is set forth in the Bid Breakdown, but is not included in the Contract Documents (Drawings, Specifications, General Conditions, and/or Addenda), the bidder is advised to leave the item blank and exclude the cost of the item from its grand total. In an attachment to its Bid Breakdown, the bidder shall provide a list of all items left blank.
- (D) If an item is not set forth in the Bid Breakdown, but is included in the Contract Documents (Drawings, Specifications, General Conditions, and/or Addenda), the bidder is advised to add the item to its Bid Breakdown and include the cost of the item in its grand total. In an attachment to its Bid Breakdown, the bidder shall provide a list of all items added.

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NEW YORK CITY DEPARTMENT OF
DESIGN + CONSTRUCTION

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION WORK

Project: Archstone Clinton Theater Fit-Out for the Alliance of Resident Theaters/ New York
 Location: 502 West 53rd Street, New York, NY 10019
 Bidder:

DDC ID: PV467ANYC
 Sponsor Agency: Dept of Cultural Affairs

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
CONTRACT 1 - GENERAL CONSTRUCTION WORK								
01 0000	GENERAL REQUIREMENTS							
01 0000	MOBILIZATION							
	Mobilization		ls					
	Security/Fire Guards		ls					
	Subtotal							
01 0150	VOLATILE ORGANIC COMPOUND (VOC) LIMITS FOR ADHESIVES, SEALANTS, PAINTS AND COATINGS (LEED BUILDING) (included w/ 019100)							
	Volatile organic compound limits for adhesives, sealants, paints, coatings		ls					
	Subtotal							
01 3520	SUSTAINABLE DESIGN REQUIREMENTS (LEED BUILDING) Existing Conditions Survey							
	Existing Conditions Survey		ls					
	Subtotal							
01 5050	CONSTRUCTION WASTE MANAGEMENT							
	Construction waste management and disposal (LEED project: comingling/sorting requirement)		ls					
	Subtotal							
01 5150	CONSTRUCTION IAQ REQUIREMENTS							
	Progress cleaning		sf					
	Final cleaning		sf					
	Subtotal							
01 9100	GENERAL COMMISSIONING REQUIREMENTS							
	Commissioning		ls					
	Subtotal							

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DDC ID: PV/467ANyc
Sponsor Agency: Dept of Cultural Affairs

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
02 0000	EXISTING CONDITIONS							
02 4119	SELECTIVE DEMOLITION							
	Remove:							
	Roll up entrance door/frame		ea					
	HM single door/frame		ea					
	HM double door/frame		ea					
	Saw cut and remove existing concrete slab to provide new stair opening		sf					
	Existing wall - mezzanine floor		sf					
	GWB wall - second floor		lf					
	Masonry wall - second floor		sf					
	Operable glazing window and aluminum frame		sf					
	Chop masonry/concrete wall to create pockets for steel at stair openings		loc					
	Chop masonry/concrete wall/beam/column to create pockets for steel floor framing		loc					
	Modification of existing elevator landing entrance opening		loc					
	Existing bollards		ea					
	Remove framing and GWB above windows to allow for pocket roller shades		loc					
	1 1/2" CW piping		loc					
	2" CW piping		loc					
	Subtotal							
03 0000	CONCRETE							
03 3000	CAST-IN-PLACE CONCRETE							
	Repair/rectify edge of new stair openings		lf					
	Concrete patching at beam pockets.		loc					
	Patch concrete sidewalk		ea					

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	4" thick lightweight concrete - mechanical room at mezzanine upper		sf					
	4" thick lightweight concrete - mechanical room at second floor upper		sf					
	Concrete fill at metal pan stairs:							
	Stair A including landings		sf					
	Stair B including landings		sf					
	Two steps - lobby 201		sf					
	Concrete fill at metal deck -ground floor stair platform		sf					
	Concrete fill at metal deck -mezzanine lower, existing opening		sf					
	Concrete fill at metal deck -mezzanine upper level		sf					
	Concrete fill at metal deck -second floor upper level		sf					
	Subtotal							
03 5416	HYDRAULIC CEMENT UNDERLAYMENT							
	1/2" concrete topping - Ardex (natural finish):							
	Mechanical rooms - mezzanine upper (MU1,MU4,MU5)		sf					
	Lighting/AV storage - mezzanine upper (MU2)		sf					
	Mechanical rooms - second floor upper (2U1,2U3,2U4)		sf					
	Subtotal							
04 0000	MASONRY							
04 2000	UNIT MASONRY							
	6" CMU wall - mechanical room, mezzanine upper, rebar and grouted cells included - 8'-6"		sf					
	Lateral clip angle support - top of CMU walls		lf					
	Subtotal							
05 0000	METALS							
05 1200	STRUCTURAL STEEL FRAMING							
	Stair stringer:							

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Ground floor to mezzanine level:							
	MC10 x 8.4		tons					
	MC12 x 10.6		tons					
	Mezzanine to 2nd floor level:							
	HSS14 x 6 x 3/8		tons					
	Ground floor stair platform:							
	W6 x 9		tons					
	S3 x 5.7		tons					
	3" diameter steel pipe (post)		tons					
	Existing floor opening to be concrete infill - mezzanine lower level:							
	Shelf angles - 3" x 3" x 1/4"		tons					
	Structural steel framing at stair openings:							
	5/8" Ø gr 50 hanger rods - stairs		lf					
	W8 x 21		tons					
	W8 x 28		tons					
	W12 x 14 (w/ drypack)		tons					
	W12 x 19		tons					
	W12 x 58		tons					
	W12 x 45 (w drypack)		tons					
	Structural steel framing for catwalk - mezzanine upper:							
	W6 x 9		tons					
	W8 x 24		tons					
	Structural steel framing for upper mezzanines:							
	3 1/2" diameter steel post		tons					
	5" diameter steel post		tons					
	W4 x 13		tons					
	W6 x 9		tons					
	W6 x 15		tons					
	W6 x 20		tons					
	W8 x 10		tons					
	W8 x 24		tons					

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	W8 x 48		tons					
	W8 x 24 (cambered)		tons					
	W8 x 48 (cambered)		tons					
	W10 x 30 (cambered)		tons					
	W10 x 45 (cambered)		tons					
	W10 x 60 (cambered)		tons					
	C4 x 5.4		ea					
	Web opening - 3 1/2"Ø unreinforced							
	Structural steel framing for lower 2nd floor:							
	W12 x 14		tons					
	W12 x 22		tons					
	HSS14 x 6 x 3/8		tons					
	Structural steel framing for upper 2nd floor:							
	3 1/2" diameter steel post		tons					
	W6 x 9		tons					
	W8 x 10		tons					
	W8 x 15		tons					
	W8 x 18		tons					
	W8 x 21		tons					
	W8 x 35		tons					
	W10 x 39 (cambered)		tons					
	C4 x 5.4		ea					
	Web opening - 3 1/2"Ø unreinforced							
	Standard connection - 10% of total tonnage		tons					
	Miscellaneous structural steel - 10% total tonnage		tons					
	Moment connection:							
	Mezzanine lower		ea					
	Mezzanine upper		ea					
	Second floor upper		ea					
	Corbel support w/ slide bearings at mezzanine upper		loc					
	Base plate w/ anchor bolts		ea					

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	Stiffener plate at beam supported column		ea					
	1/2" - 7/8" thk plate connector		ea					
	1" Fiberglass perimeter isolation board - mezzanine upper		lf					
	Shear connector on beams - 5/8"Ø x 3" long:							
	Mezzanine upper		ea					
	Subtotal							
05 3100	STEEL DECKING							
	Ground floor stair platform flooring:							
	Metal deck		sf					
	Pour stop		lf					
	Mezzanine lower - existing opening 116" x 44":							
	Metal deck		sf					
	Pour stop		lf					
	Mezzanine upper:							
	Metal deck		sf					
	Pour stop		lf					
	Second floor upper:							
	Metal deck		sf					
	Pour stop		lf					
	Subtotal							
05 5000	METAL FABRICATIONS							
	Cat walks (4' w, w/ removable guard railings on one side)		sf					
	Mobile Cart - Stainless Steel		ea					
	Prop shop / storage M-16:							
	Custom base cabinet - front		sf					
	Back splash		lf					
	New elevator door sill/support - replace existing		loc					
	1 5/8" unistrut - flush mounted, painted		lf					
	5/8" Base reveal reglet - aluminum (below 1/2" GWB wall)		lf					

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	1/4" reveal (doors and stairs)		If					
	Steel support above operable partition		If					
	Steel framing to support toilet partition		ea					
	Steel framing at floor hatch - mechanical room		ea					
	Steel framing at removable bar grating - catwalk		ea					
	Steel framing at access hatch- catwalk		ea					
	Misc. metals - supports, metal connections, shelves, etc.		ls					
	Subtotal							
05 5100	METAL STAIRS							
	Interior metal pan stairs:							
	Stair A - 31R, 3'-8"W		riser					
	Stair B - 30R, 4'-6"W		riser					
	1 3/4" Precast reinforced concrete treads:							
	Stair A (12" deep x 3'-8" wide)		ea					
	Stair B (12" deep x 4'-6" wide)		ea					
	Subtotal							
05 7000	DECORATIVE METAL							
	Stair A:							
	Perforated metal riser		If					
	Stair B:							
	Perforated metal riser		If					
	SS side panel - janitor closet/laundry		Sf					
	Subtotal							
05 7113	FABRICATED METAL SPIRAL STAIRS							
	Spiral stair - include neoprene pads at all connections		ea					
	Subtotal							

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
05 7300	HANDRAILS AND RAILINGS							
	Stair A:							
	SS single pipe hand railing on ss bracket		If					
	SS pipe railing on 1 1/2" SS handrail post with ss infill panels		If					
	Stair B:							
	SS single pipe hand railing on ss bracket		If					
	SS pipe railing on 1 1/2" SS handrail post with ss infill panels		If					
	Subtotal							
06 0000	WOOD, PLASTICS, AND COMPOSITES							
06 1000	ROUGH CARPENTRY							
	3/4" Plywood sheathing at wall		Sf					
	Blocking for electrical, video equipment, bathroom mirror, dressing room wall mtd mirror, artwork		Sf					
	Subflooring - vapor barrier, 2"x2"x5/8" wood block with 3/4" T&G exterior one layer, red rosin paper, 3/4" T&G exterior grade plywood):		Sf					
	Mezzanine level - M06 to M11, M12, M16, stair C lobby		Sf					
	2nd floor level - 204-206		Sf					
	Subtotal							
06 4023	INTERIOR ARCHITECTURAL WOODWORK							
	Wood base WD4		If					
	Wood base WD-5:		If					
	Mezzanine upper		If					
	2nd floor upper		If					
	Light box theatre below window'		If					
	Wood window sill (202, window 19,20,22)		If					
	Partial height partition - panel / 2 1/2" mtd stud with insulation/ panel, 2'-8" high		Sf					
	Information desk:							

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Mobile desk with drawer and storage base		If					
	Built-in shelves		If					
	Solid surface bench		If					
	Solid surface panel - info desk enclosure		Sf					
	Green Corridor:							
	3/4" thk bamboo panel counter, with drawer , storage base and upper cabinets		If					
	Dressing Rooms:							
	Solid surface panel counter top w/ intermediate vertical support		If					
	Solid surface panel flip-up counter top		If					
	Fixed shelf		If					
	Solid surface bench		If					
	WC (M02,M03):							
	3/4" recycled paper resin counter top		If					
	WC (M08, M10):							
	1" recycled paper resin counter top		If					
	WC (202,205,207):							
	1" recycled paper resin counter top		If					
	Control Booth:							
	3/4" thk bamboo panel counter top w/ intermediate vertical support		If					
	Janitor closet / Laundry:							
	1" recycled paper resin counter top w/ drawer and storage base		If					
	Shelves, 2 layers - solid surface		If					
	ART/NY Office:							
	3/4" thk bamboo panel counter, with drawer and storage base at both ends		If					
	Solid surface panel flip-up counter top		If					
	Prop Shop/Storage:							
	1" recycled paper resin counter top w/ WD1 shelves, 4" Kicker Pantry:		If					

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	3/4" thk bamboo panel counter, with drawer, storage base and upper cabinets		lf					
	Solid surface counter top		lf					
	Solid surface panel		sf					
	Bench M04.1 (top opens)		lf					
	Custom Millwork paneling - 12'-7 1/2" high		sf					
	Stair B - corridor M05:							
	Solid surface bench		lf					
	Solid surface panel - info desk enclosure		sf					
	Lobby:							
	Custom Millwork paneling - 8'-0" high		sf					
	Mobile cart		ea					
	Coat closet (hanger rod & open shelf)		lf					
	Control Booth:							
	3/4" thk bamboo panel counter top w/ intermediate vertical support		lf					
	Fixed shelves -prop shop/storage		lf					
	Subtotal							
	THERMAL AND MOISTURE PROTECTION							
	INTERIOR INTUMESCENT FIREPROOFING							
	Interior intumescent fireproofing		gsf					
	Subtotal							
	PENETRATION FIRESTOPPING							
	Fire stopping - for existing construction		ls					
	Subtotal							
	JOINT SEALANTS							
	Joint sealants - for existing construction		ls					
	Smoke - resistance		ls					
	Subtotal							
07 0000								
07 8123								
07 8413								
07 9200								

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
08 0000	OPENINGS							
08 1113	HOLLOW METAL DOORS AND FRAMES							
	3- 0" X 6'- 10" - single		ea					
	2- 10" X 6'- 10" - single, louvered		ea					
	3- 0" X 7'- 8 1/4" - single		ea					
	3- 0" X 7'- 8 1/2" - single		ea					
	3- 0" X 7'- 10 1/2" - single		ea					
	2- 8" X 7'- 8" - single, sliding		ea					
	2- 10" X 6'- 10" - single		ea					
	3- 0" X 7'- 8 1/4" - single		ea					
	3- 0" X 7'- 8 1/2" - single		ea					
	3- 0" X 7'- 10 1/2" - single		ea					
	2- 11" X 6'- 8" - single		ea					
	3- 0" X 7'- 4" - single		ea					
	3- 0" X 9'- 10" - single		ea					
	3- 3" X 9'- 10" - single		ea					
	3- 3" X 7'- 8 1/2" - single		ea					
	3- 0" X 6'- 8" - single		ea					
	3- 3" X 6'- 10" - single		ea					
	2- 10" X 6'- 8" - single		ea					
	2- 10" X 6'- 10" - single		ea					
	3- 0" X 7'- 8" - single		ea					
	1- 6" X 6'- 10" - double		pr					
	2- 3 1/2" X 7'- 10" - double		pr					
	3- 2" X 6'- 8" - double		pr					
	2- 10" X 9'- 10" - double		pr					
	2- 3" X 6'- 8" - double		pr					
	Subtotal							

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
08 1416	WOOD DOORS 3'-5" x 7'-10" - sliding, mezzanine level		ea					
	Subtotal							
08 3113	ACCESS DOORS AND FRAMES Access floor hatch - mechanical rooms Access hatch - to catwalk Removable bar grating - catwalk Metal access panel, powder coated - bathrooms M02, M03, M10, 205, 207 Access hatch - ceiling: 8" x 8" 2' x 2' 2' x 5'		ea ea ea ea ea ea ea ea					
	Subtotal							
08 3473	SOUND CONTROL HOLLOW METAL DOOR ASSEMBLIES Acoustically rated door 3'-0" x 5'-3" Acoustically rated door 3'-0" x 6'-10" Acoustically rated door 3'-3" x 6'-10" Acoustically rated door 6'-0" x 6'-10" Acoustically rated egress door 6'-0" x 9'-10"		ea ea ea pr pr					
	Subtotal							
08 3513	ALUMINUM FRAMED SLIDING WALL SYSTEM Ground Floor - operable facade, insulated: North Elevation South Elevation		sf sf					
	Subtotal							

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
08 4113	INTERIOR ALUMINUM STOREFRONTS							
	Aluminum operable sound-proofing interior glazing system (matte black) with G2 glazing - 3' - 4" X 12' - 0" including all associated connections etc. (light box theater, mezzanine lower)		sf					
	Subtotal							
08 5113	ALUMINUM WINDOWS							
	Acoustical Glazing:							
	Control Booth MU3 operable glazing, 2'-10" h x 33'-7 1/2" w		sf					
	Control Booth 2U2 operable glazing, 2'-10" x 13'-0"		sf					
	Control Booth 2U2 operable glazing, 2'-10" x 7'-1 1/2"		sf					
	Control Booth 2U2 operable glazing, 2'-10" x 14'-7"		sf					
	Aluminum operable casement window with G3 glazing - 3' - 4" X 12' - 0' including all associated connections etc. (north of corridor M05, mezzanine lower)		sf					
	Subtotal							
08 7100	DOOR HARDWARE							
	HM Single acoustically rated		ea					
	HM Double acoustically rated		pr					
	HM Single		ea					
	HM Single - sliding		ea					
	HM Double		pr					
	WD Single - sliding (bi-fold)		ea					
	TP-3 (WC's) Single		ea					
	Subtotal							
08 8000	GLAZING							
	Bathroom mirror		sf					
	Channel framed mirror - dressing room		ea					

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Bidder:

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Wall mounted mirror - dressing room		sf					
	Subtotal							
08 9000	LOUVERS							
	Exterior aluminum drainable storm louver 33" x 36" - to match existing		EA					
	Subtotal							
09 0000	FINISHES							
09 2900	GYP SUM BOARD ASSEMBLIES							
	Ground Floor level:							
	7/8" furring channel with two layer gyp bd and full cavity insulation from floor to underside of slab above. - 17'-0"		If					
	3 5/8" metal studs with two layer gyp bd one side and full cavity insulation from floor to underside of slab above. 17' - 0"		If					
	6" metal studs with two layer gyp bd both sides and full cavity insulation from floor to underside of slab above. 17'-0"		If					
	3 5/8" metal studs w/ two layers 5/8" GWB both sides and insulation - 17'-0"		If					
	4" C-H metal stud with 1" gwb shaft liner on one side and with two layers 5/8" gwb with full cavity insulation on the other side from floor to underside of slab above. 17'-0"		If					
	2 sets - 3 5/8" metal studs with one layer gyp bd and full cavity insulation from floor to underside of slab above. 17' - 0" at ground floor		If					
	3 5/8" metal studs with one layer gyp bd both sides and full cavity insulation from floor to underside of slab above. 17' - 0"		If					
	Mezzanine Lower:							
	7/8" furring channel with two layer gyp bd and full cavity insulation from floor to underside of slab above. - 8'-6"		If					

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NEW YORK CITY DEPARTMENT OF DESIGN + CONSTRUCTION

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION WORK

Project: Archstone Clinton Theater Fit-Out for the Alliance of Resident Theaters/ New York

Location: 502 West 53rd Street, New York, NY 10019

Bidder:

DDC ID: PV467ANYC

Sponsor Agency: Dept of Cultural Affairs

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	7/8" furring channel with two layer gyp bd and full cavity insulation from floor to underside of slab above. - 17'-0"		If					
	3 5/8" metal studs with two layer gyp bd one side and insulation from floor to underside of slab above. 17' - 0"		If					
	3 5/8" metal studs with two layer gyp bd one side and insulation from floor to underside of slab above. 8' - 6"		If					
	3 5/8" metal studs with two layer gyp bd one side and insulation from floor to underside of slab above. 17' - 0"		If					
	3 5/8" metal studs with one 5/8" gwb & 5/8" cementitious bd one side and insulation from floor to underside of slab above. 8' - 6"		If					
	3 5/8" metal studs with two layers gyp bd both sides and insulation from floor to underside of slab above. 8' - 6"		If					
	3 5/8" metal studs with two layers gyp bd both sides and insulation from floor to underside of slab above. 17' - 0"		If					
	3 5/8" metal studs with two layers gyp bd both sides and insulation from floor to underside of slab above. 8' - 6"		If					
	6" metal studs with two layer gyp bd both sides and full cavity insulation from floor to underside of slab above. 8'-6"		If					
	3 5/8" metal studs with two layers gyp bd both sides and insulation from floor to underside of slab above. 17'-0"		If					
	3 5/8" metal studs with two layers gyp bd both sides and insulation from floor to underside of slab above. 8' - 6"		If					
	3 5/8" metal studs with one 5/8" gwb & 5/8" cementitious bd both sides and insulation from floor to underside of slab above. 8' - 6"		If					
	3 5/8" metal studs with two gwb on one side and one 5/8" gwb & 5/8" cementitious bd on the other side and insulation from floor to underside of slab above. 8' - 6"		If					
	3 5/8" metal studs with two layers gyp bd both sides and insulation from floor to underside of slab above. 8' - 6"		If					

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NEW YORK CITY DEPARTMENT OF
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CONTRACTOR'S BID BREAKDOWN FORM

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Location: 502 West 53rd Street, New York, NY 10019
Bidder:

DDC ID: PV467ANNC
Sponsor Agency: Dept of Cultural Affairs

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	6" metal studs with two layer gyp bd both sides and full cavity insulation from floor to underside of slab above. 8'-6"		If					
	Two rows of 3 5/8" metal studs with two layers gyp bd both sides and full cavity insulation from floor to underside of slab above. 8' - 6"		If					
	Two rows - 1 5/8" metal studs with one layer gyp bd & 5/8" cementitious bd both sides and full cavity insulation from floor to underside of slab above. 8' - 6"		If					
	Two rows - 1 5/8" metal studs with two 5/8" gwb on one side and one layer gyp bd & 5/8" cementitious bd on the other side and full cavity insulation from floor to underside of slab above. 8' - 6"		If					
	Two rows - 6" metal studs with two layer gyp bd both sides and full cavity insulation from floor to underside of slab above. 8'-6"		If					
	Mezzanine Upper:							
	3 5/8" metal studs with two layer gyp bd one side and insulation from floor to underside of slab above. 8' - 6"		If					
	7/8" mtl furring with two 5/8" gwb and insulation from floor to underside of slab above on one side of 6" CHB and 3 5/8" mt studs with two 5/8" gwb and full cavity insulation from floor to underside of slab above on the other side of 6" CHB, provide acoustical padding at header - 8'-6"		If					
	3 5/8" metal studs with two layers gyp bd both sides and insulation from floor to underside of slab above. 8' - 6"		If					
	6" metal studs with two layer gyp bd both sides and full cavity insulation from floor to underside of slab above. 8'-6"		If					
	3 5/8" metal studs with two layers gyp bd both sides and insulation from floor to underside of slab above. 8' - 6"		If					
	3 5/8" metal studs with two layers gyp bd both sides and insulation from floor to underside of slab above. 8' - 6"		If					

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CONTRACT 1 - GENERAL CONSTRUCTION WORK

Project: Archstone Clinton Theater Fit-Out for the Alliance of Resident Theaters/ New York
 Location: 502 West 53rd Street, New York, NY 10019
 Bidder:

DDC ID: PV467ANyc
 Sponsor Agency: Dept of Cultural Affairs

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Two rows of 3 5/8" metal studs with two layers gyp bd both sides and full cavity insulation from floor to underside of slab above. 8' - 6"		If					
	Second Floor Lower:							
	2 1/2" metal studs with two layer gyp bd one side and insulation from floor to underside of slab above. 17' - 0"		If					
	7/8" furring channel with two layer gyp bd and full cavity insulation from floor to underside of slab above. - 17'-0"		If					
	3 5/8" metal studs with two layer gyp bd one side and insulation from floor to underside of slab above. 17' - 0"		If					
	3 5/8" metal studs with two layer gyp bd one side and insulation from floor to underside of slab above. 17' - 0" (theatre 2)		If					
	3 5/8" metal studs with one 5/8" gwb & 5/8" cementitious bd one side and insulation from floor to underside of slab above. 8' - 6"		If					
	3 5/8" metal studs w/ two layers 5/8" GWB both sides and insulation (theatre 2) - 17'-0"		If					
	3 5/8" metal studs with two layers gyp bd both sides and insulation from floor to underside of slab above. 8' - 6"		If					
	3 5/8" metal studs with two gwb on one side and one 5/8" gwb & 5/8" cementitious bd on the other side and insulation from floor to underside of slab above. 8' - 6"		If					
	2 sets - 3 5/8" metal studs with two layer gyp bd and full cavity insulation from floor to underside of slab above. 8' - 6" at ground floor		If					
	Two rows of 3 5/8" metal studs with two layers gyp bd both sides and full insulation from floor to underside of slab above. 17' - 0"		If					

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CONTRACT 1 - GENERAL CONSTRUCTION WORK

Project: Archstone Clinton Theater Fix-Out for the Alliance of Resident Theaters/ New York

Location: 502 West 53rd Street, New York, NY 10019

Bidder:

DDC ID: PV467ANyc

Sponsor Agency: Dept of Cultural Affairs

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Two rows of 3 5/8" metal studs with two layers gyp bd both sides and full insulation from floor to underside of slab above. 17' - 0"(theatre 2)		lf					
	Two rows - 1 5/8" metal studs with two 5/8" gwb on one side and one layer gyp bd & 5/8" cementitious bd on the other side and full cavity insulation from floor to underside of slab above. 8' - 6"		lf					
	Second Floor Upper:							
	3 5/8" metal studs with one 5/8" gwb & 5/8" cementitious bd one side and insulation from floor to underside of slab above. 8' - 6"		lf					
	3 5/8" metal studs with two layers gyp bd both sides and insulation from floor to underside of slab above. 8' - 6"		lf					
	2 sets - 3 5/8" metal studs with one layer gyp bd and full cavity insulation from floor to underside of slab above. 8' - 6" at ground floor		lf					
	1/2" GWB w/ 3/4" fire resistive plywood /6" LGMF with batt insulation at Mezzanine lower level:							
	Theatre 1 - 17' high		lf					
	Green room - 17' high		lf					
	Green corridor - 17' high		lf					
	Prop shops/storage - 8' high		lf					
	Corridor M17 - 17' high		lf					
	1/2" GWB w/ 3/4" fire resistive plywood - theatre 1, 17' high		lf					
	1/2" GWB w/ 3/4" fire resistive plywood - theatre 2, 17' high		lf					
	Added 1/2" GWB at wall partitions		sf					
	Level 5 finish - GWB wall		sf					
	Grounds and blocking		sf					
	Gyp bd header above operable partition		lf					
	Install HM doors, frames and hardware - single		ea					
	Install HM doors, frames and hardware - single, sliding		ea					
	Install HM doors, frames and hardware - double		pr					

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Install WD doors, frames and hardware - single, sliding		ea					
	Install Acoustically rated door, frame and hardware - single		ea					
	Install Acoustically rated door, frame and hardware - double		pr					
	Install Bathroom accessories		ea					
	Ceilings:							
	Gyp bd ceilings at entrance vestibule		sf					
	Gyp bd ceilings at entrance lobby		sf					
	Gyp bd ceilings		sf					
	Gyp. Bd soffit		lf					
	Gyp bd ceilings, below new floor construction - (3 layers),		sf					
	1/2"GWB/2-5/8" GWB/ 1 1/2" mtl furring		lf					
	Gyp bd window shade pockets		lf					
	Gypsum board pipe enclosure/boxing-in with insulation		lf					
	Subtotal							
09 3100	CERAMIC TILING							
	Ceramic floor tile		sf					
	Ceramic mosaic wall tile		sf					
	Ceramic base - 4" high		lf					
	Saddle		ea					
	0.125" acoustic underlayment - ceramic floor tile		sf					
	Waterproofing:							
	Bathrooms		sf					
	Mechanical rooms		sf					
	Subtotal							
09 5425	WOOD CEILINGS							
	3/4" fire-resistant plywood panel ceiling (2 layers):		sf					
	Green room (M15)		sf					
	Theater 2 (203)		sf					
	Sound attenuation blanket - at plywood panel ceiling		sf					

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Acoustic panel absorber		sf					
	Curved plywood panel ceiling - theater one		sf					
	Subtotal							
09 6440	SPRUNG WOOD FLOORING							
	Sprung wood floor : vapor barrier, 2"x2"x5/8" wood block with 3/4" T&G exterior one layer, red rosin paper, 3/4" T&G exterior grade plywood and 1/4" hardply masonite (matte black):		sf					
	Theater 1 (M14)		sf					
	Theater 2 (203)		sf					
	Floor protection		sf					
	Subtotal							
09 6513	RESILIENT FLOORING							
	25" x 25" x 1/4" thick rubber tile (black):		sf					
	Janitor's closet/laundry/prop shop/storage		sf					
	Spiral stairs C&E		sf					
	25" x 25" x 1/4" thick rubber tile (gray):		sf					
	Ground floor lobby		sf					
	Ground floor information desk		sf					
	Ground floor storage 3A & 3B		sf					
	2nd floor corridor 200		sf					
	Rubber baseboard		lf					
	0.4" thick acoustic underlayment:		sf					
	Rubber flooring (RB3)		sf					
	Subtotal							
09 6813	TILE CARPETING							
	Carpet tile - 20" x 20"		sy					
	Floor preparation		sf					
	Carpet tread - spiral stairs:							

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Spiral stair C		SY					
	Spiral stair E		SY					
	Floor preparation		SF					
	Subtotal							
09 7200	WALL COVERINGS							
	1/4" Cork wall panel - wall covering at A.R.T./NY office M13		SF					
	Subtotal							
09 7723	FABRIC-WRAPPED WALL PANELS							
	2" Fabric wrapped fiberglass panel		SF					
	1" Fabric wrapped panel		SF					
	Removable fabric protection pads - 3'-0" x 4'-2"		EA					
	Subtotal							
09 8436	SOUND-ABSORBING CEILING UNITS							
	Tectum ceiling (1" tectum) - acoustical surface:		SF					
	Mezzanine lower corridors (M06,M17,M18)		SF					
	Mezzanine upper control booth (MU3)		SF					
	2nd floor upper control booth (2U2)		SF					
	Subtotal							
09 9100	PAINTING							
	Stairs A,B		EA					
	Spiral stair		EA					
	Doors & Frames Single		EA					
	Doors & Frames Double		PR					
	Gyp Bd walls		SF					
	Gyp Bd ceilings		SF					
	Gyp Bd soffit		LF					
	Tectum ceiling - painted black		SF					

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Metal bar grating, catwalk - 1 1/4" x 3/16"		sf					
	Exposed concrete ceiling:							
	Storage - ground floor		sf					
	Theatre 1		sf					
	Mezzanine upper - Mechanical/ Utility room		sf					
	2nd floor upper - Mechanical/ Utility room		sf					
	Concrete floor sealer		sf					
	Wood base		lf					
	Misc. Painting		sf					
	Subtotal							
10 0000	SPECIALTIES							
10 1200	DISPLAY CASES							
	Acrylic display cases - surface mounted:							
	Ground floor lobby		sf					
	Mezzanine lower corridor M05/pantry M04		sf					
	2nd floor lobby		sf					
	Subtotal							
10 1400	SIGNAGE							
	Interior signage - identification, directional:							
	Custom flat cut aluminum sign lettering and tactile sign		ls					
	Subtotal							
10 2113	TOILET COMPARTMENTS							
	Urinal partition - S.S.		ea					
	Toilet partition - S.S.		ea					
	Toilet partition, S.S., H.C.		ea					
	Subtotal							

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
10 2800	TOILET ACCESSORIES							
	Toilet paper dispenser		ea					
	Soap dispenser - wall mounted		ea					
	SS grab bar - 36"		ea					
	SS grab bar - 42"		ea					
	Baby changing station - recessed		ea					
	Paper towel dispenser - recessed		ea					
	Waste receptacle - recessed		ea					
	Air freshener - wall mounted		ea					
	Toilet seat sanitizer dispenser		ea					
	Toilet and Urinal cleaner dispenser		ea					
	Hand sanitizer dispenser		ea					
	Sanitary napkin dispenser - recessed		ea					
	Surface mounted napkin/lampoon disposal		ea					
	Toilet paper dispenser - stainless steel		ea					
	Shower seat		ea					
	Shower rod		ea					
	Subtotal							
10 4400	FIRE PROTECTION SPECIALTIES							
	Fire extinguisher cabinets:							
	Surface mounted		ea					
	Recessed		ea					
	Subtotal							
11 0000	EQUIPMENT							
11 3100	APPLIANCES							
	Washing machine, automatic - front loading		ea					
	Dryer, electric - front loading		ea					
	Refrigerator - undercounter		ea					
	Freezer - undercounter		ea					

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Ice maker - undercounter		ea					
	Subtotal							
11 6123	PERFORMANCE PLATFORMS							
	Theatrical Platforms:							
	Theatre 1		ls					
	Theatre 2		ls					
	Subtotal							
11 6143	PERFORMANCE DRAPERIES AND RIGGING ACCESSORIES							
	Stage Draperies:							
	Theatre 1		ls					
	Theatre 2		ls					
	Theatrical Rigging:							
	Theatre 1		ls					
	Theatre 2		ls					
	Subtotal							
11 6151	PERFORMANCE PIPE GRID							
	Pipe Grid:							
	Theatre 1		ls					
	Theatre 2		ls					
	Subtotal							
11 6191	PERFORMANCE LIGHTING INSTRUMENTS AND ACCESSORIES							
	Theatrical projection screen:							
	Theatre 1		ls					
	Theatre 2		ls					
	Theatrical Lighting Instruments and Accessories:							
	Theatre 1		ls					

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Theatre 2		ls					
	Subtotal							
<u>12 0000</u>	<u>FURNISHINGS</u>							
<u>12 2413</u>	<u>ROLLER WINDOW SHADES</u>							
	Manual surface mounted blackout shades w/ side rails		sf					
	Manual surface mounted blackout shades - pantry existing window		sf					
	Valance and manual shade - pantry existing window		sf					
	Manual surface mounted translucent shades		sf					
	Double roller shades - black-out:							
	window 001 -016, 023-027		sf					
	window 019-022		sf					
	Subtotal							
<u>12 4813</u>	<u>ENTRANCE FLOOR MATS AND FRAMES</u>							
	1/2" Entry roll-up mat - vestibule		sf					
	Subtotal							
<u>14 0000</u>	<u>CONVEYINGSYSTEMS</u>							
<u>14 2400</u>	<u>HYDRAULIC ELEVATORS</u>							
	Modify existing elevator controllers		ls					
	Replace existing horizontal freight elevator doors with new vertical passenger elevator doors (satin SS)		ea					
	New elevator Cab:							
	Stainless steel metal panel		sf					
	Stainless steel welded frame - 17.2 mm handrail		lf					
	Plexiglas display case		lf					
	SS base		lf					
	Rubber flooring		sf					
	Subtotal							

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
14 4200	WHEELCHAIR LIFTS							
	Lift - 2 stop complete - Handicap		ea					
	Subtotal							
	TOTAL CONTRACT 1 - GENERAL CONSTRUCTION WORK							

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CONTRACT 1 - PLUMBING WORK

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
CONTRACT 2 - PLUMBING WORK								
22 0000	PLUMBING							
22 0500	COMMON WORK RESULTS FOR PLUMBING							
	Cut/cap/disconnect existing plumbing fixtures prior to demolition		ls					
	Existing plumbing system modification due to conflict with new layout.		ls					
	Provide for shut downs and temporary work		ls					
	Access doors		ls					
	Core/bore/fireproofing and set sleeves at wall/floor penetrations		sf					
	Water meter - 3"		ea					
	Motor requirements:							
	Circulator pump with (2) 4KW elements		ea					
	Circulator pump with 1 1/2 KW elements		ea					
	Subtotal							
22 0519	METERS AND GAGES FOR PLUMBING (included w/ sectiond 221116 and 224000)							
22 0529	HANGERS AND SUPPORTS FOR PLUMBING PIPING							
	Noise reducing pipe hanger and support		ls					
	Subtotal							
22 0533	HEAT TRACING FOR PLUMBING PIPING							
	Heat tracing for plumbing piping		lf					
	Heat tracing system for HVAC piping		lf					
	Subtotal							
22 0548	VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT							
	Vibration isolators		ls					
	Subtotal							

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
22 0553	IDENTIFICATION FOR PLUMBING PIPING & EQUIPMENT Identification for plumbing system		ls					
	Subtotal							
22 0700	PLUMBING INSULATION Domestic Water: Pipe insulation; 4" piping		If					
	Subtotal							
22 0800	COMMISSIONING OF PLUMBING Commissioning - assist Enhanced commissioning - LEED requirement		ls ls					
	Subtotal							
22 1116	DOMESTIC WATER PIPING Piping: ¾"Ø to 1 ¼"Ø HWR&S, CW 2"Ø to 3"Ø CW Misc. valves		If If ls					
	Subtotal							
22 1119	DOMESTIC WATER PIPING SPECIAL TIES (included w/ section 221116)							
22 1316	SANITARY WASTE AND VENT PIPING Sanitary Service: 2" Ø 3" Ø 4" Ø Reroute existing 4" sanitary line - to clear new stair opening Vent Service: 2" - 3" Ø		If If If If If					
	Subtotal							

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22 1319	SANITARY WASTE PIPING SPECIALTIES							
	Sanitary Service:							
	Clean outs 3" Ø - 4" Ø		ea					
	Connection to existing sanitary drains		ea					
	3"Ø Floor drain		ea					
	4"Ø Floor drain		ea					
	Vent Service:							
	Misc gauges, trims and fittings		ls					
	Subtotal							
22 3300	ELECTRIC DOMESTIC WATER HEATER							
	Electric storage water heaters		ea					
	Instant hot water heaters		ea					
	Subtotal							
22 4000	PLUMBING FIXTURES							
	Water Closet:							
	Sensor operated		ea					
	Sensor operated-handicap		ea					
	Urinals - sensor operated		ea					
	Lavatories - sensor operated		ea					
	Utility sink		ea					
	Washer connection valves, ¾" Ø		ea					
	Showers/ Shower pan and controls, handicapped		ea					
	Washer connection valves, ½" Ø		ea					
	Drinking fountain - ADA		ea					
	Drinking fountain		ea					
	Misc trim and piping		ls					
	Hose bibb		ea					
	Subtotal							
	TOTAL CONTRACT 2 - PLUMBING WORK							

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NEW YORK CITY DEPARTMENT OF
DESIGN + CONSTRUCTION

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 3 - HEATING, VENTILATION AND AIR CONDITIONING WORK

Project: Archstone Clinton Theater Fit-Out for the Alliance of Resident Theaters/ New York
 Location: 502 West 53rd Street, New York, NY 10019
 Bidder: _____

DDC ID: PV467ANyc
 Sponsor Agency: Dept of Cultural Affairs

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
CONTRACT 3 - HEATING, VENTILATION AND AIR CONDITIONING WORK								
21 0000	FIRE SUPPRESSION							
21 0500	COMMON WORK RESULTS FOR FIRE SUPPRESSION							
	Demolition:							
	Cut and cap existing piping		ls					
	Hydraulic calculations		ls					
	Subtotal							
21 0548	VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT							
	Vibration and seismic controls		ls					
	Subtotal							
21 1200	FIRE-SUPPRESSION STANDPIPES							
	3" Ø to 4" Ø distribution pipe		lf					
	3" floor control valve assembly - replace existing 2 1/2"		ea					
	4" floor control valve assembly - replace existing 2 1/2"		ea					
	Subtotal							
21 1313	WET-PIPE SPRINKLER SYSTEMS							
	Sprinkler Piping:							
	1" Ø branch pipe		lf					
	2 1/2" Ø pipe		lf					
	Concealed sprinkler heads		ea					
	Pendant mounted sprinkler heads		ea					
	Up right sprinkler heads		ea					
	Up right sprinkler heads under duct		ea					
	Connect to existing piping		loc					
	Valves and misc piping, etc		ls					
	3" sleeves at steel beams		ea					

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NEW YORK CITY DEPARTMENT OF
DESIGN + CONSTRUCTION

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 3 - HEATING, VENTILATION AND AIR CONDITIONING WORK

Project: Archstone Clinton Theater Theater Fit-Out for the Alliance of Resident Theaters/ New York

Location: 502 West 53rd Street, New York, NY 10019

Bidder:

DDC ID: PV467ANYC

Sponsor Agency: Dept of Cultural Affairs

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Fire valve cabinet		ea					
	Fire hose valve		ea					
	Fire hose cabinet		ea					
	Subtotal							
23 0000	HEATING, VENTILATING AND AIR CONDITIONING							
23 0500	COMMON WORK RESULTS FOR HVAC							
	Temporary Heating		ls					
	Connection to existing ductwork		ea					
	Access doors		ls					
	Rigging and delivery		ls					
	Subtotal							
23 0513	COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT (included w/ other Division 23 sections)							
23 0519	METERS AND GAGES FOR HVAC PIPING (included w/ other Division 23 sections)							
23 0523	GENERAL-DUTY VALVES FOR HVAC PIPING (included w/ other Division 23 sections)							
23 0529	HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT							
	Noise reducing hangers and supports for HVAC piping and equipment		ls					
	Subtotal							
23 0548	VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT							
	Vibration isolators		ls					
	Subtotal							

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NEW YORK CITY DEPARTMENT OF
DESIGN + CONSTRUCTION

CONTRACTORS BID BREAKDOWN FORM

Project: Archstone Clinton Theater Fit-Out for the Alliance of Resident Theaters/ New York
 Location: 502 West 53rd Street, New York, NY 10019
 Bidder:

CONTRACT 3 - HEATING, VENTILATION AND AIR CONDITIONING WORK
 DDC ID: PV467ANYC
 Sponsor Agency: Dept of Cultural Affairs

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
23 0553	IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT		ls					
	Identification for HVAC system							
	Subtotal							
23 0593	TESTING, ADJUSTING AND BALANCING		ls					
	Testing/ Adjusting/ Balancing							
	Subtotal							
23 0700	HVAC INSULATION		lf					
	Piping insulation							
	Duct insulation		sf					
	Acoustical lining		sf					
	Subtotal							
23 0800	COMMISSIONING OF HVAC		ls					
	Commissioning - assist							
	Enhanced commissioning - LEED requirement		ls					
	Subtotal							
23 0900	INSTRUMENTATION AND CONTROL FOR HVAC							
	HVAC Controls:							
	FCU		ea					
	VAV		ea					
	Thermostatic control valve		ea					
	Cabinet unit heater		ea					
	Motorized dampers		ea					
	Backdraft dampers		ea					
	Exhaust fans		ea					
	Lighting integration		ea					
	Variable frequency drivers		ea					
	Temperature sensor		ea					

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NEW YORK CITY DEPARTMENT OF
DESIGN + CONSTRUCTION

Project: Archstone Clinton Theater Fit-Out for the Alliance of Resident Theaters/ New York
Location: 502 West 53rd Street, New York, NY 10019
Bidder:

CONTRACT 3 - HEATING, VENTILATION AND AIR CONDITIONING WORK

CONTRACTOR'S BID BREAKDOWN FORM

DDC ID: PV467ANYC
Sponsor Agency: Dept of Cultural Affairs

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Humidistat		ea					
	CO2 sensor		ea					
	Occupancy sensor		ea					
	Controls capability to meet M&V and outdoor air delivery		ls					
	Leak detection system:							
	BMS connection FCU		ea					
	SS drip pan, water proof epoxy coated with leak detection sensor and solenoid valve for drip pans FCU		ea					
	Provide leak detection system control panel w/ control wiring		loc					
	Tie-in to existing control system, including re-programming		gsf					
	Subtotal							
23 0993	SEQUENCE OF OPERATIONS FOR HVAC CONTROLS							
	Sequence of operation for HVAC		ls					
	Subtotal							
23 2113	HYDRONIC PIPING							
	Connection to existing piping:		ls					
	3/4" Cond piping		If					
	1" - 1 1/2" C&HWS&R		If					
	3/4" - 1" H&HWS&R		If					
	1 1/4" - 1 1/2" H&HWS&R		If					
	2" - 2 1/2" H&HWS&R		If					
	3" H&HWS&R		If					
	4" H&HWS&R		If					
	Misc piping valves and trim		gsf					
	Subtotal							
23 3113	METAL DUCTS							
	Ductwork - supply, return		lb					

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NEW YORK CITY DEPARTMENT OF
DESIGN + CONSTRUCTION

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 3 - HEATING, VENTILATION AND AIR CONDITIONING WORK

Project: Archstone Clinton Theater Fit-Out for the Alliance of Resident Theaters/ New York
Location: 502 West 53rd Street, New York, NY 10019
Bidder:

DDC ID: PV467ANYC
Sponsor Agency: Dept of Cultural Affairs

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Round ductwork:		If					
	4"		If					
	6"		If					
	10"		If					
	16" insulated		If					
	Subtotal							
23 3300	AIR DUCT ACCESSORIES							
	Dampers		ea					
	Fire dampers		ea					
	Fire/ Smoke dampers		ea					
	Smoke dampers		ea					
	Motorized dampers		ea					
	Backdraft dampers		ea					
	Louver with bird screen 33" X 36" with bird screen		ea					
	Wire mesh screens		ea					
	Sound attenuators - (duct silencers):		ea					
	5 ft		ea					
	3 ft		ea					
	Subtotal							
23 3416	CENTRIFUGAL HVAC FANS							
	Exhaust Fan - 200 cfm		ea					
	Subtotal							
23 3600	AIR TERMINAL UNITS							
	VAV G-1 - 170 cfm		ea					
	VAV M-1 - 855 cfm		ea					
	VAV M-2 - 175 cfm		ea					
	VAV M-3 - 195 cfm		ea					
	VAV M-4 - 1,550 cfm		ea					

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NEW YORK CITY DEPARTMENT OF
DESIGN + CONSTRUCTION

CONTRACTOR'S BID BREAKDOWN FORM

Project: Archstone Clinton Theater Fit-Out for the Alliance of Resident Theaters/ New York
Location: 502 West 53rd Street, New York, NY 10019
Bidder:

CONTRACT 3 - HEATING, VENTILATION AND AIR CONDITIONING WORK

DDC ID: PV467ANYC
Sponsor Agency: Dept of Cultural Affairs

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	VAV M-5 - 90 cfm		ea					
	VAV 2-1 - 740 cfm		ea					
	VAV 2-2 - 65 cfm		ea					
	VAV 2-3 - 705 cfm		ea					
	VAV 2-4 - 125 cfm		ea					
	Subtotal							
23 3713	DIFFUSERS, REGISTERS AND GRILLES							
	Register and diffusers:							
	CD-2		ea					
	CD-3		ea					
	CD-4		ea					
	RD		ea					
	SG-1		ea					
	RG-1		ea					
	EG		ea					
	Linear diffuser:							
	LD-1, 4' - 0"		lf					
	LD-2, 4' - 0"		lf					
	Subtotal							
23 8219	FAN COIL UNITS							
	FCU - G-1 - 700 cfm		cfm					
	FCU - M-1 - 1,000 cfm		cfm					
	FCU - M-2 - 3,000 cfm		cfm					
	FCU - M-3 - 600 cfm		cfm					
	FCU - M-4 - 650 cfm		cfm					
	FCU - M-5 - 9,200 cfm		cfm					
	FCU - 2-1 - 2,450 cfm		cfm					
	FCU - 2-2 - 760 cfm		cfm					
	FCU - 2-3 - 5,300 cfm		cfm					

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NEW YORK CITY DEPARTMENT OF
DESIGN + CONSTRUCTION

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 3 - HEATING, VENTILATION AND AIR CONDITIONING WORK

Project: Archstone Clinton Theater Fit-Out for the Alliance of Resident Theaters/ New York
 Location: 502 West 53rd Street, New York, NY 10019
 Bidder:

DDC ID: PV467ANVC
 Sponsor Agency: Dept of Cultural Affairs

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	FCU - 2-4 - 350 cfm		cfm					
	Subtotal							
23 8233	CONVECTORS							
	Fin tube radiation - JVKL 114, 2 rows		lf					
	Subtotal							
23 8239	UNIT HEATERS							
	Electric unit heater 250 CFM		ea					
	Subtotal							
	TOTAL CONTRACT 3 - HEATING, VENTILATION AND AIR CONDITIONING WORK							

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NEW YORK CITY DEPARTMENT OF DESIGN + CONSTRUCTION

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 4 - ELECTRIC WORK

Project: Archstone Clinton Theater Fit-Out for the Alliance of Resident Theaters/ New York
Location: 502 West 53rd Street, New York, NY 10019
Bidder:

DDC ID: PV467ANYC
Sponsor Agency: Dept of Cultural Affairs

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	CONTRACT 4 - ELECTRIC WORK							
	ELECTRICAL							
26 0000	COMMON WORK RESULTS FOR ELECTRICAL							
26 0500	Provide disconnect/safe off		gsf					
	Temporary Power and lighting		gsf					
	Demolish and discard existing electrical layout		ls					
	Core/bore/fireproofing and set sleeves at wall/floor penetrations		ea					
	Provide for welding hook up		ea					
	Rigging		ls					
	Subtotal							
26 0519	LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES							
	Provide electrical power/ feeders to the following:							
	FCU		ea					
	EUH		ea					
	EWV		ea					
	Pumps		ea					
	Fans		ea					
	HC lift		ea					
	Leak detection system BMS connection		ea					
	VFD		ea					
	Heat tracing		ea					
	Subtotal							
26 0526	GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS							
	Grounding		ls					
	Subtotal							

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NEW YORK CITY DEPARTMENT OF
DESIGN + CONSTRUCTION

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 4 - ELECTRIC WORK

Project: Archstone Clinton Theater Fit-Out for the Alliance of Resident Theaters/ New York
 Location: 502 West 53rd Street, New York, NY 10019
 Bidder:

DDC ID: PV467ANVC
 Sponsor Agency: Dept of Cultural Affairs

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
26 0527	AUDIO AND VIDEO SYSTEMS ELECTRICAL CONTAINMENT AND GROUNDING (included w/ section 2741161)							
26 0529	HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS Hangers and Supports		ls					
	Subtotal							
26 0533	RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS (included w/ section 260519)							
26 0548	VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS Vibration isolators		ls					
	Subtotal							
26 0553	IDENTIFICATION FOR ELECTRICAL SYSTEMS Identification		ls					
	Subtotal							
26 0573	SHORT CIRCUIT/ COORDINATION STUDY/ ARC FLASH HAZARD ANALYSIS (included w/ other Div. 26 sections)							
26 0800	COMMISSIONING OF ELECTRICAL Commissioning - assist Enhanced commissioning - LEED requirements		ls ls					
	Subtotal							
26 0923	LIGHTING CONTROL DEVICES Lighting controls		ls					
	Subtotal							

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NEW YORK CITY DEPARTMENT OF
DESIGN + CONSTRUCTION

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 4 - ELECTRIC WORK

Project: Archstone Clinton Theater Fit-Out for the Alliance of Resident Theaters/ New York
Location: 502 West 53rd Street, New York, NY 10019
Bidder:

DDC ID: PV467ANYC
Sponsor Agency: Dept of Cultural Affairs

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
26 0943	NETWORK LIGHTING CONTROLS (included w/ other Div. 26 sections)							
26 2200	LOW VOLTAGE DISTRIBUTION TRANSFORMERS							
	75 kva Transformer		ea					
	150 kva Transformer		ea					
	Automatic transfer switch		ls					
	Disconnect switch		ea					
	Subtotal							
26 2413	SWITCHBOARDS							
	Electrical Infrastructure:							
	The info existing 1,200A electrical service including meter, transformer through with feeders		ea					
	1200A new switchboard		ea					
	Panels:							
	400 A		ea					
	400 A		ea					
	100 A		ea					
	100 A		ea					
	800 A		ea					
	800 A		ea					
	100 A		ea					
	100 A		ea					
	100 A		ea					
	100 A		ea					
	200 A		ea					
	201 A		ea					
	100 A		ea					
	100 A		ea					
	100 A		ea					
	Sub meters - lighting panels (for LEED)		ea					
	Subtotal							

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NEW YORK CITY DEPARTMENT OF
DESIGN + CONSTRUCTION

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 4 - ELECTRIC WORK

Project: Archstone Clinton Theater Fit-Out for the Alliance of Resident Theaters/ New York
 Location: 502 West 53rd Street, New York, NY 10019
 Bidder:

DDC ID: PV467ANYC

Sponsor Agency: Dept of Cultural Affairs

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
26 2726	WIRING DEVICES							
	Outlets:							
	Duplex		ea					
	GFI		ea					
	Quad		ea					
	Simplex		ea					
	Junction box		ea					
	Switches		ea					
	Switches occupancy sensors		ea					
	Switches 3 way		ea					
	Switches wall dimmer		ea					
	Switches key operated		ea					
	Safety devices - miscellaneous DS		ea					
	4" empty conduit		lf					
	Provide for electrical risers and feeders for panels above		ea					
	Subtotal							
26 2813	FUSES (included w/ section 262726)							
26 2816	ENCLOSED SWITCHES AND CIRCUIT BREAKERS							
	Disconnect switches - 250A		ea					
	Disconnect switches - 400A		ea					
	Disconnect switches - 500A		ea					
	Disconnect switches - 800A		ea					
	Disconnect switches - 20A		ea					
	Subtotal							
26 2913	ENCLOSED CONTROLLERS (included w/ sections 260519 and 260923)							

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NEW YORK CITY DEPARTMENT OF
DESIGN + CONSTRUCTION

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 4 - ELECTRIC WORK

Project: Archstone Clinton Theater Fit-Out for the Alliance of Resident Theaters/ New York
 Location: 502 West 53rd Street, New York, NY 10019
 Bidder:

DDC ID: PV467ANVC
 Sponsor Agency: Dept of Cultural Affairs

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
26 2923	VARIABLE FREQUENCY MOTOR CONTROLLER (included w/ section 260519)							
26 3353	STATIC UNINTERRUPTIBLE POWER SUPPLY (UPS) 24 KVA emergency lighting inverter		ea					
	Subtotal							
26 4313	TRANSIENT-VOLTAGE SUPPRESSION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS (TVSS) Transient-voltage suppression for low-voltage electrical power circuits		gsf					
	Subtotal							
26 5100	INTERIOR LIGHTING Neon light - exterior		ea					
	Type AC-1		If					
	Type AD-1		ea					
	Type AD-2		ea					
	Type AB-1		ea					
	Type AL-1, 4 ft		ea					
	Type AL-2		If					
	Type AL-3, 4 ft		ea					
	Type AL-5, 4 ft		ea					
	Type AM-1		ea					
	Type AT-1		If					
	Type AT-2		If					
	Type AU-1		ea					
	Type AW-1		ea					
	Type AW-2		ea					
	Type AU-1 (Industrial fluorescent, 4 ft)		ea					
	Light Box:							
	Type AL-1, 4 ft		ea					

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NEW YORK CITY DEPARTMENT OF DESIGN + CONSTRUCTION

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 4 - ELECTRIC WORK

Project: Archstone Clinton Theater Fit-Out for the Alliance of Resident Theaters/ New York

Location: 502 West 53rd Street, New York, NY 10019

Bidder:

DDC ID: PV467ANYC

Sponsor Agency: Dept of Cultural Affairs

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Type AL-3, 4 ft		ea					
	Dark Box:							
	Type AL-3, 4 ft		ea					
	Exit/ Emergency lights		ea					
	Subtotal							
26 6111	PERFORMANCE DIMMING AND CONTROL							
	Theatre 1 dimming and controls		ea					
	Theatre 2 dimming and controls		ea					
	Subtotal							
27 0000	COMMUNICATIONS							
27 0500	COMMON WORK RESULTS FOR COMMUNICATIONS							
	50" Digital flat screen TV display		ea					
	Subtotal							
27 0553	IDENTIFICATION FOR TELECOMMUNICATION SYSTEMS							
	(included w/ sections 271323 and 271500)							
27 1116	TELECOMMUNICATIONS CABINETS, RACKS, FRAMES AND ENCLOSURES (included w/ section 271500)							
27 1323	TELECOMMUNICATIONS OPTICAL FIBER BACKBONE CABLING							
	Empty conduit system - (Stub ups only with wire tray in hall way to accommodate Audio Video and Electronic and Security) - data		ea					
	Subtotal							

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NEW YORK CITY DEPARTMENT OF DESIGN + CONSTRUCTION

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 4 - ELECTRIC WORK

Project: Archstone Clinton Theater Fit-Out for the Alliance of Resident Theaters/ New York

Location: 502 West 53rd Street, New York, NY 10019

Bidder:

DDC ID: PV467ANYC

Sponsor Agency: Dept of Cultural Affairs

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
27 1500	TELECOMMUNICATIONS HORIZONTAL CABLING							
	Stub ups only with wire tray in hall way to accommodate Audio		ea					
	Video and Electronic and Security - audio/video							
	Subtotal							
27 4116	AUDIO AND AUDIOVISUAL SYSTEMS							
	Integrated audio-video systems and equipment for theaters:							
	Theater 1		ls					
	Theater 2		ls					
	Subtotal							
28 0000	ELECTRONIC SAFETY AND SECURITY							
28 0000	COMMON WORK RESULTS FOR ELECTRONIC SECURITY							
	Low voltage empty conduit system		sf					
	Subtotal							
28 1000	ACCESS CONTROL AND ALARM MONITORING SYSTEM							
	Access control panel		ea					
	Magnetic contact		ea					
	Electric locking device		ea					
	Subtotal							
28 2000	VIDEO SURVEILLANCE SYSTEM (VSS)							
	Fixed camera		ea					
	Motion detector		ea					
	Network video recorder		ea					
	Video intercom door station		ea					
	Video intercom master station		ea					
	Subtotal							

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NEW YORK CITY DEPARTMENT OF
DESIGN + CONSTRUCTION

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 4 - ELECTRIC WORK

Project: Archstone Clinton Theater Fit-Out for the Alliance of Resident Theaters/ New York
 Location: 502 West 53rd Street, New York, NY 10019
 Bidder:

DDC ID: PV467ANYYC
 Sponsor Agency: Dept of Cultural Affairs

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
28 3000	SECURITY INTERCOMMUNICATIONS SYSTEM (SIS)							
	Card reader		ea					
	Card reader w/ integrated key pad		ea					
	Subtotal							
28 3111	FIRE ALARM							
	Tie into existing fire alarm system		ls					
	Fire Alarm panel		ea					
	Fire alarm annunciator panel		ea					
	Remote fire alarm annunciation panel		ea					
	Fire Alarm Devices:							
	Smoke detectors		ea					
	Smoke detectors - elevator recall		ea					
	Speakers - ceiling mounted		ea					
	Combination horn/strobe - wall mounted		ea					
	Combination speaker/strobe - ceiling mounted		ea					
	Combination speaker/strobe - wall mounted		ea					
	Manual fire alarm pull station		ea					
	Fire alarm addressable module		ea					
	Furnish and install wiring for new fire alarm system		sf					
	Grounding		ls					
	Subtotal							
TOTAL CONTRACT 4 - ELECTRIC WORK								

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DESCRIPTION AND LOCATION OF WORK:

Archstone Clinton Theater Fit-Out for the Alliance of Resident Theatres/NY
 502 West 53rd Street
 New York, NY 10019
 E-PIN: 85013B0121 / DDC PIN: 8502013PV0023C G.C; E-PIN: 85013B0122 / DDC PIN:
 8502013PV0026C PLBG; E-PIN: 85013B0123 / DDC PIN: 8502013PV0024C HVAC; E-PIN:
 85013B0124 / DDC PIN: 8502013PV0025C ELECTRICAL

DOCUMENTS AVAILABLE AT:

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

SUBMISSION OF BIDS BEFORE BID OPENING:

TIME TO SUBMIT:

On or Before: **THURSDAY, NOVEMBER 14, 2013**

BIDS MUST BE CLOCKED IN PRIOR TO BID OPENING

PLACE TO SUBMIT:

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

BID OPENING:

PLACE OF BID OPENING:	Department of Design and Construction Contract Section 30-30 Thomson Avenue – First Floor Long Island City, NY 11101
DATE AND HOUR:	THURSDAY, NOVEMBER 14, 2013 @ 2:00 pm
	LATE BIDS WILL NOT BE ACCEPTED

PRE-BID CONFERENCE:

PLACE	Archstone Clinton Theater 502 West 53 rd Street New York, NY 10019
DATE AND HOUR	THURSDAY, OCTOBER 24, 2013 AT 10:00AM
MANDATORY OR OPTIONAL	MANDATORY

BID SECURITY:

Bid Security is required in the amount set forth below; provided, however, bid security is not required if the TOTAL BID PRICE set forth on the Bid Form is less than \$ 1,000,000.00.

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

PERFORMANCE AND PAYMENT SECURITY:

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

AGENCY CONTACT PERSON:

Lorraine Holley, 30-30 Thomson Avenue – First Floor, Long Island City, Queens, NY 11101
 Telephone (718) 391-2200 or (718) 391-2601 Fax: (718) 391-2615



**BID BOOKLET
PART B**

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SAFETY QUESTIONNAIRE

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

1. Bidder Information:

Company Name: _____

DDC Project Number: _____

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

_____ Company has previously worked for DDC

2. Type(s) of Construction Work

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

3. Experience Modification Rate:

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

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

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

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

4. OSHA Information:

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

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

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

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

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

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

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

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

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

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

5. Safety Performance on Previous DDC Project(s)

_____ Contractor previously audited by the DDC Office of Site Safety.

DDC Project Number(s): _____

_____ Accident on previous DDC Project(s).

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

Date: _____

By: _____
 (Signature of Owner, Partner, Corporate Officer)

Title: _____

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Pre-Award Process

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

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

- (A) **Project Reference Form:** If required, the bidder must complete and submit the Project Reference Form set forth on pages 28 through 30 of this Bid Booklet. The Project Reference Form consists of 3 parts: (1) Similar Contracts Completed by the Bidder, (2) Contracts Currently Under Construction by the Bidder, and (3) Pending Contracts Not Yet Started by the Bidder.
- (B) **Copy of License:** If required, the bidder must submit a copy of the license under which the bidder will be performing the work. Such license must clearly show the following: (1) Name of the Licensee, (2) License Number, and (3) Expiration date of the License. A copy of the license will be required from bidders for the following contracts: Plumbing Work, Electrical Work and Asbestos Abatement.
- (C) **Financial Information:** If required, the bidder must submit the financial information described below:
- (1) **Audited Financial Statements:** Financial statements (Balance Sheet and Income Statement) of the entity submitting the bid, as audited by an independent auditor licensed to practice as a certified public accountant (CPA). Audited financial statements for the three most recent fiscal years must be submitted. Each such financial statement must include the auditor's standard report.
- If the bidder does not have audited financial statements, it must submit an affidavit attesting to the fact that the bidder does not have such statements. In addition, the bidder must submit the following documentation covering the three most recent fiscal years: signed federal tax returns, unaudited financial statements, and a "certified review letter" from a certified public accountant (CPA) verifying the unaudited financial statements.
- Unless the most recent audited or unaudited financial statement was issued within ninety (90) days, the bidder must submit interim financial information that includes data on financial position and results of operation (income data) for the current fiscal year. Such information may be summarized on a monthly or quarterly basis or at other intervals.
- (2) **Schedule of Aged Accounts Receivable,** including portion due within ninety (90) days.
- (D) **Project Specific Information:** If required, the bidder must submit the project specific information described below:
- (1) **Statement** indicating the number of years of experience the bidder has had and in what type of construction.
- (2) **Resumes** of all key personnel to be involved in the project, including the proposed project superintendent.
- (3) **List** of significant pieces of equipment expected to be used for the contract, and whether such equipment is owned or leased.

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

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

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

A. PROJECT REFERENCES – SIMILAR CONTRACTS COMPLETED BY THE BIDDER

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

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

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

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

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

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

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

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

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

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

Contractor: _____

Address: _____

Telephone Number: _____

Name and Title of Signatory: _____

Contracting Agency or Owner: _____

Project Number: _____

Proposed Contract Amount: _____

Description and Address of Proposed Contract: _____

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

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

Date

Signature

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

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VENDEX COMPLIANCE

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

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

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

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

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

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

Date of Submission: _____

By: _____
(Signature of Partner or corporate officer)

Print Name: _____

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

By: _____
(Signature of Partner or corporate officer)

Print Name: _____

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



Certificate of No Change Form

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

I, _____, being duly sworn, state that I have read
Enter Your Name

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

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

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

Vendor Questionnaire *This section is required.*

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

Name of Submitting Entity: _____

Vendor's Address: _____

Vendor's EIN or TIN: _____ Requesting Agency: _____

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

Signature date on the last full vendor questionnaire signed for the submitting vendor: _____

Signature date on change submission for the submitting vendor: _____

Principal Questionnaire

This section refers to the most recent principal questionnaire submissions.



Principal Name	Date of signature on last full Principal Questionnaire	Date(s) of signature on submission of change
1		
2		
3		
4		
5		
6		

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

Certification *This section is required.*

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

Certified By:

Name (Print)

Title

Name of Submitting Entity

Signature

Date

Notarized By:

Notary Public

County License Issued

License Number

Sworn to before me on: _____
Date

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



Certificate of No Change Form

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

I, _____, being duly sworn, state that I have read
Enter Your Name

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

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

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

Vendor Questionnaire *This section is required.*

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

Name of Submitting Entity: _____

Vendor's Address: _____

Vendor's EIN or TIN: _____ Requesting Agency: _____

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

Signature date on the last full vendor questionnaire signed for the submitting vendor: _____

Signature date on change submission for the submitting vendor: _____

Principal Questionnaire

This section refers to the most recent principal questionnaire submissions.



Principal Name	Date of signature on last full Principal Questionnaire	Date(s) of signature on submission of change
1		
2		
3		
4		
5		
6		

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

Certification *This section is required.*

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

Certified By:

Name (Print)

Title

Name of Submitting Entity

Signature

Date

Notarized By:

Notary Public

County License Issued

License Number

Sworn to before me on: _____
Date

IRAN DIVESTMENT ACT COMPLIANCE RIDER
FOR NEW YORK CITY CONTRACTORS

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

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

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

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

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

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

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

[Please Check One]

BIDDER'S CERTIFICATION

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

Dated: _____, New York
_____, 20__

SIGNATURE

PRINTED NAME

TITLE

Sworn to before me this
____ day of _____, 20__

Notary Public

Dated:

CITY OF NEW YORK

DIVISION OF LABOR SERVICES

CONSTRUCTION EMPLOYMENT REPORT

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CONSTRUCTION EMPLOYMENT REPORT

GENERAL INFORMATION

1. Your contractual relationship in this contract is: Prime contractor Subcontractor
- 1a. Are M/WBE goals attached to this project? Yes No
2. Please check one of the following if your firm would like information on how to certify with the City of New York as a:
 Minority Owned Business Enterprise Locally based Business Enterprise
 Women Owned Business Enterprise Emerging Business Enterprise
- 2a. If you are certified as an MBE, WBE, or LBE, what city/state agency are you certified with? _____ Are you DBE certified? Yes No
3. Please indicate if you would like assistance from SBS in identifying certified M/WBEs for contracting opportunities: Yes No
4. Is this project subject to a project labor agreement? Yes No

PART I: CONTRACTOR/SUBCONTRACTOR INFORMATION

5. _____
Employer Identification Number or Federal Tax I.D./ _____ Email Address
6. _____
Company Name
7. _____
Company Address and Zip Code
8. _____
Chief Operating Officer Telephone Number
9. _____
Designated Equal Opportunity Compliance Officer Telephone Number
(If same as Item #7, write "same")
10. _____
Name of Prime Contractor and Contact Person
(If same as Item #5, write "same")
11. Number of employees in your company: _____

12. Contract information:

- (a) _____ Contracting Agency (City Agency) (b) _____ Contract Amount
(d) _____ Procurement Identification Number (PIN) (e) _____ Contract Registration Number (CT#)
(f) _____ Projected Commencement Date (g) _____ Projected Completion Date

(h) Description and location of proposed contract:

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

If yes, attach a copy of certificate.

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

If yes, attach a copy of certificate.

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

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

Date submitted: _____
Agency to which submitted: _____
Name of Agency Person: _____
Contract No: _____
Telephone: _____

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

If yes,

(a) Name and address of OFCCP office.

(b) Was a Certificate of Equal Employment Compliance issued within the past 36 months?
Yes ___ No ___

If yes, attach a copy of such certificate.

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

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

(d) Were any deficiencies found? Yes ___ No ___

If yes, attach a copy of such findings.

17. Is your company or its affiliates a member or members of an employers' trade association which is responsible for negotiating collective bargaining agreements (CBA) which affect construction site hiring? Yes ___ No ___

If yes, attach a list of such associations and all applicable CBA's.

PART II: DOCUMENTS REQUIRED

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

___ (a) Health benefit coverage/description(s) for all management, nonunion and union employees (whether company or union administered)

___ (b) Disability, life, other insurance coverage/description

___ (c) Employee Policy/Handbook

___ (d) Personnel Policy/Manual

___ (e) Supervisor's Policy/Manual

___ (f) Pension plan or 401k coverage/description for all management, nonunion and union employees, whether company or union administered

___ (g) Collective bargaining agreement(s).

___ (h) Employment Application(s)

___ (i) Employee evaluation policy/form(s).

___ (j) Does your firm have medical and/or non-medical (i.e. education, military, personal, pregnancy, child care) leave policy?

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

(a) Prior to job offer Yes ___ No ___

(b) After a conditional job offer Yes ___ No ___

(c) After a job offer Yes ___ No ___

(d) Within the first three days on the job Yes ___ No ___

(e) To some applicants Yes ___ No ___

(f) To all applicants Yes ___ No ___

(g) To some employees Yes ___ No ___

(h) To all employees Yes ___ No ___

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

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

If yes, is the medical examination given:

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

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

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

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

23. Does the company have a current affirmative action plan(s) (AAP)
___ Minorities and Women
___ Individuals with handicaps
___ Other. Please specify _____

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

If yes, please attach a copy of this policy.

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

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

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

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

If yes, attach a log. See instructions.

27. Are there any jobs for which there are physical qualifications? Yes ___ No ___

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

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

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

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SIGNATURE PAGE

I, (print name of authorized official signing) _____ hereby certify that the information submitted herewith is true and complete to the best of my knowledge and belief and submitted with the understanding that compliance with New York City's equal employment requirements, as contained in Chapter 56 of the City Charter, Executive Order No. 50 (1980), as amended, and the implementing Rules and Regulations, is a contractual obligation.

I also agree on behalf of the company to submit a certified copy of payroll records to the Division of Labor Services on a monthly basis.

Contractor's Name

Name of person who prepared this Employment Report Title

Name of official authorized to sign on behalf of the contractor Title

Telephone Number

Signature of authorized official Date

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

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

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

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

Only original signatures accepted.

Sworn to before me this _____ day of _____ 20 _____

Notary Public Authorized Signature Date

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FMS ID: PV467ANYC



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

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

Contract for Furnishing all Labor and Material Necessary and Required for:

CONTRACT NO. 1 GENERAL CONSTRUCTION WORK
CONTRACT NO. 2 PLUMBING WORK
CONTRACT NO. 3 HVAC + FIRE PROTECTION WORK
CONTRACT NO. 4 ELECTRICAL WORK

Archstone Clinton Theater Fit-Out for the Alliance of Resident Theatres/ New York

LOCATION: 502 West 53rd Street
BOROUGH: New York, NY 10019
CITY OF NEW YORK

Contractor _____

Dated _____, 20____

Entered in the Comptroller's Office

First Assistant Bookkeeper _____

Dated _____, 20____





PROJECT ID: PV467ANYC

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

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

VOLUME 2 OF 3

**INFORMATION FOR BIDDERS
CONTRACT
PERFORMANCE AND PAYMENT BONDS
SCHEDULE OF PREVAILING WAGES
GENERAL CONDITIONS**

FOR FURNISHING ALL LABOR AND MATERIALS
NECESSARY AND REQUIRED FOR THE PROJECT

**Archstone Clinton Theater Fit-Out for
the Alliance of Resident Theatres/ New
York**

LOCATION: 502 West 53rd Street
BOROUGH: New York, NY 10019
CITY OF NEW YORK

CONTRACT NO. 1	GENERAL CONSTRUCTION WORK
CONTRACT NO. 2	PLUMBING WORK
CONTRACT NO. 3	HVAC + FIRE PROTECTION WORK
CONTRACT NO. 4	ELECTRICAL WORK

Department of Cultural Affairs

Toshiko Mori Architects

Date: June 20, 2013



11 3-067



10/10/10



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

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NOTICE TO BIDDERS

Please be advised that the City of New York has revised the form of the performance bond that is required for City construction contracts that do not exceed \$5 million. The form of bond required for contracts that are greater than \$5 million has not changed. The City now has two approved forms. One form is to be used for contracts that do not exceed \$5 million and one form is to be used for contracts above \$5 million. The City's payment bond remains unchanged.

The new bond form for contracts that do not exceed \$5 million has been approved by the U.S. Small Business Administration ("SBA") for participation in their Bond Guarantee Program. The SBA's Bond Guarantee Program enables eligible small businesses to obtain or increase bonding by having the SBA act as a partial guarantor of the contractor to the surety. If you are interested in participating in this program, we suggest that you contact your broker or the SBA.

In order to maximize participation by small businesses in the SBA Guarantee Program, the City also encourages prime contractors who are awarded contracts greater than \$5 million to allow their subcontractors to use the SBA-approved form, particularly on contracts that are subject to Local Law 129 (the M/WBE program), if the prime contractor requires subcontractors to obtain performance bonds.

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NOTICE TO BIDDERS, PROPOSERS, CONTRACTORS, AND RENEWAL CONTRACTORS

This contract includes a provision concerning the protection of employees for whistleblowing activity, pursuant to New York City Local Law Nos. 30-2012 and 33-2012, effective October 18, 2012 and September 18, 2012, respectively. The provisions apply to contracts with a value in excess of \$100,000.

Local Law No. 33-2012, the Whistleblower Protection Expansion Act ("WPEA"), prohibits a contractor or its subcontractor from taking an adverse personnel action against an employee or officer for whistleblower activity in connection with a City contract; requires that certain City contracts include a provision to that effect; and provides that a contractor or subcontractor may be subject to penalties and injunctive relief if a court finds that it retaliated in violation of the WPEA. The WPEA is codified at Section 12-113 of the New York City Administrative Code.

Local Law No. 30-2012 requires a contractor to prominently post information explaining how its employees can report allegations of fraud, false claims, criminality, or corruption in connection with a City contract to City officials and the rights and remedies afforded to employees for whistleblowing activity. Local Law No. 30-2012 is codified at Section 6-132 of the New York City Administrative Code.

WHISTLEBLOWER PROTECTION EXPANSION ACT RIDER

1. In accordance with Local Law Nos. 30-2012 and 33-2012, codified at sections 6-132 and 12-113 of the New York City Administrative Code, respectively,
 - (a) Contractor shall not take an adverse personnel action with respect to an officer or employee in retaliation for such officer or employee making a report of information concerning conduct which such officer or employee knows or reasonably believes to involve corruption, criminal activity, conflict of interest, gross mismanagement or abuse of authority by any officer or employee relating to this Contract to (i) the Commissioner of the Department of Investigation, (ii) a member of the New York City Council, the Public Advocate, or the Comptroller, or (iii) the City Chief Procurement Officer, ACCO, Agency head, or Commissioner.
 - (b) If any of Contractor's officers or employees believes that he or she has been the subject of an adverse personnel action in violation of subparagraph (a) of paragraph 1 of this rider, he or she shall be entitled to bring a cause of action against Contractor to recover all relief necessary to make him or her whole. Such relief may include but is not limited to: (i) an injunction to restrain continued retaliation, (ii) reinstatement to the position such employee would have had but for the retaliation or to an equivalent position, (iii) reinstatement of full fringe benefits and seniority rights, (iv) payment of two times back pay, plus interest, and (v) compensation for any special damages sustained as a result of the retaliation, including litigation costs and reasonable attorney's fees.
 - (c) Contractor shall post a notice provided by the City in a prominent and accessible place on any site where work pursuant to the Contract is performed that contains information about:
 - (i) how its employees can report to the New York City Department of Investigation allegations of fraud, false claims, criminality or corruption arising out of or in connection with the Contract; and
 - (ii) the rights and remedies afforded to its employees under New York City Administrative Code sections 7-805 (the New York City False Claims Act) and 12-113 (the Whistleblower Protection Expansion Act) for lawful acts taken in connection with the reporting of allegations of fraud, false claims, criminality or corruption in connection with the Contract.
 - (d) For the purposes of this rider, "adverse personnel action" includes dismissal, demotion, suspension, disciplinary action, negative performance evaluation, any action resulting in loss of staff, office space, equipment or other benefit, failure to appoint, failure to promote, or any transfer or assignment or failure to transfer or assign against the wishes of the affected officer or employee.
 - (e) This rider is applicable to all of Contractor's subcontractors having subcontracts with a value in excess of \$100,000; accordingly, Contractor shall include this rider in all subcontracts with a value in excess of \$100,000.
2. Paragraph 1 is not applicable to this Contract if it is valued at \$100,000 or less. Subparagraphs (a), (b), (d), and (e) of paragraph 1 are not applicable to this Contract if it was solicited pursuant to a finding of an emergency. Subparagraph (c) of paragraph 1 is neither applicable to this Contract if it was solicited prior to October 18, 2012 nor if it is a renewal of a contract executed prior to October 18, 2012.

Notice to Bidders:

In 2013 the City will be implementing a new web based subcontractor reporting system. Once this subcontractor reporting system is implemented, and Contractor receives notice of its implementation, Contractor will be required to list in the system all of the subcontractors that it knows it will use or is already using in the performance of this contract. For each subcontractor listed, Contractor will be required to provide the following information: maximum contract value, description of subcontractor work, start and end date of the subcontract and identification of the subcontractor's industry. Identification of subcontractors in the system along with the required information will be required in order to obtain subcontractor approval under [section 3.02 of Appendix A][Article 17 of the Standard Construction Contract] and PPB Rule § 4-13 for all subcontractors that have not been approved as of the implementation date. Thereafter, Contractor will be required to report in the system the payments made to each subcontractor within 30 days of making the payment. If any of the required information changes throughout the term of the contract, Contractor will be required to revise the information in the system...

When the subcontractor reporting system is implemented, Contractor will receive a written notice from the City which will contain the information the Contractor will need to list its subcontractors and report payments. Contractor will not be required to comply with the requirements set forth herein until such notice is received. Contractor will have 30 days from the date of the notice to list its current subcontractors for which it has already received Agency approval, if any. Thereafter, for those subcontractors that have not yet been approved by the Agency, subcontractors will have to be listed in the system in order to obtain the required Agency approval.

Failure of the Contractor to list a subcontractor and/or to report subcontractor payments in a timely fashion may result in the Agency declaring the Contractor in default of the Contract and may subject Contractor to liquidated damages in the amount of \$100 per day for each day that the Contractor fails to identify a subcontractor along with the required information about the subcontractor and/or fails to report payments to a subcontractor, beyond the time frames set forth herein or in the notice from the City. For construction contracts, the provisions of Article 15 of the Standard Construction Contract shall govern the issue of liquidated damages.

Contractor hereby agrees to these provisions and acknowledges that they will become effective on the date set forth in the notice.

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

INFORMATION FOR BIDDERS

September 2008

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INFORMATION FOR BIDDERS

1. Description and Location of Work

The description and location of the work for which bids are requested are specified in Attachment 1, "Bid Information". Attachment 1 is included in the Bid Booklet.

2. Time and Place for Receipt of Bids

Sealed bids shall be received on or before the date and hour specified in Attachment 1, at which time they will be publicly opened and read aloud in the presence of the Commissioner or his or her representative, and any bidders who may desire to be present.

3. Definitions

The definitions set forth in the Procurement Policy Board Rules shall apply to this Invitation For Bids.

4. Invitation For Bids and Contract Documents

(A) Except for titles, sub-titles, headings, running headlines, tables of contents and indices (all of which are printed herein merely for convenience) the following, except for such portions thereof as may be specifically excluded, shall be deemed to be part of the Contract and the Invitation for Bids.

- (1) All provisions required by law to be inserted in this Contract, whether actually inserted or not
- (2) The Contract Drawings and Specifications
- (3) The General Conditions, the General Requirements and the Special Conditions, if any
- (4) The Contract
- (5) The Information for Bidders; Request for Proposals; Notice of Solicitation and Proposal For Bids; Bid or Proposal, and, if used, the Bid Booklet
- (6) The Budget Director's Certificate; all Addenda issued prior to the receipt of the bids; the Notice of Award; Performance and Payment Bonds, if required; and the Notice to Proceed with the Work.

(B) For particulars as to this procurement, including quantity and quality of the purchase, extent of the work or labor to be performed, delivery and performance schedule, and any other special instructions, prospective bidders are referred to the Invitation For Bids Documents. A copy of such documents can be obtained at the location set forth in Attachment 1.

(C) Deposit for Copy of Invitation For Bids Documents: Prospective bidders may obtain a copy of the Invitation For Bids Documents by complying with the conditions set forth in the Notice of Solicitation. The deposit must be in the form of a check or money order made payable to the City of New York, and drawn upon a state or national bank or trust company, or a check of such bank or trust company signed by a duly authorized officer thereof.

(D) Return of Invitation For Bids Documents: All Invitation For Bids Documents must be returned to the Department upon request. If the bidder elects not to submit a bid thereunder, the Invitation For Bids Documents shall be returned to the Department, along with a statement that no bid will be submitted.

(E) Return of Deposit: Such deposit will be returned within 30 days after the award of the contract or the rejection of all bids as set forth in the advertisement, provided the Invitation For Bids Documents are returned to the location specified in Attachment 1, in physical condition satisfactory to the Commissioner.

(F) Additional Copies: Additional copies of the Invitation For Bids Documents may be obtained, subject to the conditions set forth in the advertisement for bids.

5. Pre-Bid Conference

A pre-bid conference shall be held as set forth in Attachment 1. Nothing stated at the pre-bid conference shall change the terms or conditions of the Invitation For Bids Documents, unless a change is made by written amendment as provided in Section 9 below. Failure to attend a mandatory pre-bid conference shall constitute grounds for the rejection of the bid.

6. Agency Contact

Any questions or correspondence relating to this bid solicitation shall be addressed to the Agency Contact person specified in Attachment 1.

7. Bidder's Oath

(A) The bid shall be properly signed by an authorized representative of the bidder and the bid shall be verified by the written oath of the authorized representative who signed the bid, that the several matters stated and information furnished therein are in all aspects true.

(B) A materially false statement willfully or fraudulently made in connection with the bid or any of the forms completed and submitted with the bid may result in the termination of any Contract between the City and the Bidder. As a result, the Bidder may be barred from participating in future City contracts as well as be subject to possible criminal prosecution.

8. Examination and Viewing of Site, Consideration of Other Sources of Information and Changed Conditions

(A) Pre-Bidding (Investigation) Viewing of Site - Bidders must carefully view and examine the site of the proposed work, as well as its adjacent area, and seek other usual sources of information, for they will be conclusively presumed to have full knowledge of any and all conditions on, about or above the site relating to or affecting in any way the performance of the work to be done under the Contract which were or should have been indicated to a reasonably prudent bidder. To arrange a date for visiting the work site, bidders are to contact the Agency Contact person specified in Attachment 1.

(B) Should the contractor encounter during the progress of the work subsurface conditions at the site materially differing from any shown on the Contract Drawings or indicated in the Specifications or such subsurface conditions as could not reasonably have been anticipated by the contractor and were not anticipated by the City, which conditions will materially affect the cost of the work to be done under the Contract, the attention of the Commissioner must be called immediately to such conditions before they are disturbed. The Commissioner shall thereupon promptly investigate the conditions. If he finds that they do so materially differ, or that they could not reasonably have been anticipated by the contractor and were not anticipated by the City, the Contract may be modified with his written approval.

9. Examination of Proposed Contract

(A) Request for Interpretation or Correction: Prospective bidders must examine the Contract Documents carefully and before bidding must request the Commissioner in writing for an interpretation or correction of every patent ambiguity, inconsistency or error therein which should have been discovered by a reasonably prudent bidder. Such interpretation or correction, as well as any additional contract provisions the Commissioner may decide to include, will be issued in writing by the Commissioner as an addendum to the Contract, which will be transmitted to each person recorded as having received a copy of the Contract Documents from the Department. Transmission of such addendum will be by mail, e-mail, facsimile or hand delivery. Such addendum will also be posted at the place where the Contract Documents are available for the inspection of prospective bidders. Upon transmission as provided for herein, such addendum shall become a part of the Contract Documents, and binding on all bidders, whether or not actual notice of such addendum is shown.

(B) Only Commissioner's Interpretation or Correction Binding: Only the written interpretation or correction so given by the Commissioner shall be binding, and prospective bidders are warned that no other officer, agent or employee of the City is authorized to give information concerning, or to explain or interpret, the Contract.

(C) Documents given to a subcontractor for the purpose of soliciting the subcontractor's bid shall include either a copy of the bid cover sheet or a separate information sheet setting forth the project name, the Contract number (if available), the contracting agency and the Project's location.

10. Form of Bid

Each bid must be submitted upon the prescribed form and must contain: a) the name, residence and place of business of the person or persons making the same; b) the names of all persons interested therein, and if no other person is so interested, such fact must be distinctly stated; c) a statement to the effect that it is made without any connection with any other person making a bid for the same purpose and that it is in all respects fair and without collusion or fraud; d) a statement that no Council member or other officer or employee or person whose salary is payable in whole or part from the City Treasury is directly or indirectly interested therein or in the supplies, materials or equipment and work or labor to which it relates, or in any portion of the profits thereof; e) a statement that the bidder is not in arrears to the City or to any agency upon a debt or contract or taxes, and is not a defaulter as surety or otherwise upon any obligation to the City to any agency thereof, except as set forth in the bid.

THE BID SHALL BE TYPEWRITTEN OR WRITTEN LEGIBLY IN INK. THE BID SHALL BE SIGNED IN INK. ERASURES OR ALTERATIONS SHALL BE INITIALED BY THE SIGNER IN INK. FAILURE TO CONFORM TO THE REQUIREMENTS OF THIS SECTION 10 SHALL RESULT IN THE REJECTION OF THE BID.

11. Irrevocability of Bid

The prices set forth in the bid cannot be revoked and shall be effective until the award of the Contract, unless the bid is withdrawn as provided for in Sections 15 and 18 below.

12. Acknowledgment of Amendments

The receipt of any amendment to the Contract Documents shall be acknowledged by the bidder in its bid submission.

13. Bid Samples and Descriptive Literature

Bid samples and descriptive literature shall not be submitted by the bidder, unless expressly requested elsewhere in the Contract or Contract Documents. Any unsolicited bid samples or descriptive literature which are submitted shall not be examined or tested and shall not be deemed to vary any of the provisions of this Contract.

14. Proprietary Information/Trade Secrets

(A) The bidder shall identify those portions of the bid which it deems to be confidential, proprietary information or trade secrets, and provide justification why such materials shall not be disclosed by the City. All such materials shall be clearly indicated by stamping the pages on which such information appears, at the top and bottom thereof with the word "Confidential". Such materials stamped "Confidential" must be easily separable from the non-confidential sections of the bid.

(B) All such materials so indicated shall be reviewed by the Agency and any decision not to honor a request for confidentiality shall be communicated in writing to the bidder. For those bids which are unsuccessful, all such confidential materials shall be returned to the bidder. Prices, makes and model or catalog numbers of the items offered, deliveries, and terms of payment shall be publicly available after bid opening, regardless of any designation of confidentiality made by the bidder.

15. Pre-Opening Modification or Withdrawal of Bids

Bids may be modified or withdrawn by written notice received in the office designated in Attachment 1, before the time and date set for the bid opening. If a bid is withdrawn in accordance with this Section, the bid security, if any, shall be returned to the bidder.

16. Bid Evaluation and Award

In accordance with the New York City Charter, the Procurement Policy Board Rules and the terms and conditions of this Invitation For Bids, this Contract shall be awarded, if at all, to the responsible bidder whose bid meets the requirements and evaluation criteria set forth in the Invitation For Bids, and whose bid price is either the most favorable bid price or, if the Invitation For Bids so states, the most favorable evaluated bid price. A bid may not be evaluated for any requirement or criterion that is not disclosed in the Invitation For Bids.

Restriction: No negotiations with any bidder shall be allowed to take place except under the circumstances and in the manner set forth in Section 21. Nothing in this Section shall be deemed to permit a contract-award to a bidder submitting a higher quality item than that designated in the Invitation For Bids, if that bid is not also the most favorable bid.

17. Late Bids, Late Withdrawals and Late Modifications

Any bid received at the place designated in the solicitation after the time and date set for receipt of bids is late and shall not be considered. Any request for withdrawal or modification received at the place designated in the solicitation after the time and date set for receipt of bids is late and shall not be considered. The exception to this provision is that a late modification of a successful bid that makes the bid terms more favorable to the City shall be considered at any time it is received.

18. Withdrawal of Bids.

Except as provided for in Section 15, above, a bidder may not withdraw its bid before the expiration of forty-five (45) days after the date of the opening of bids; thereafter, a bidder may withdraw its bid only in writing and in advance of an actual award. If within sixty (60) days after the execution of the Contract, the Commissioner fails to fix the date for commencement of work by written notice to the bidder, the bidder, at his option, may ask to be relieved of his obligation to perform the work called for by written notice to the Commissioner. If such notice is given to the Commissioner, and the request to withdraw is granted, the bidder waives all claims in connection with this Contract.

19. Mistake in Bids

(A) Mistake Discovered Before Bid Opening: A bidder may correct mistakes discovered before the time and date set for bid opening by withdrawing or correcting the bid as provided in Section 15 above.

(B) Mistakes Discovered Before Award

(1) In accordance with General Municipal Law (Section 103, subdivision 11), where a unilateral error or mistake is discovered in a bid, such bid may be withdrawn upon written approval of the Agency Chief Contracting Officer if the following conditions are met:

- (a) The mistake is known or made known to the agency prior to the awarding of the Contract or within 3 days after the opening of the bid, whichever period is shorter; and
- (b) The price bid was based upon an error of such magnitude that enforcement would be unconscionable; and

- (c) The bid was submitted in good faith and the bidder submits credible evidence that the mistake was a clerical error as opposed to a judgment error; and
- (d) The error in the bid is actually due to an unintentional and substantial arithmetic error or an unintentional omission of a substantial quantity of work, labor, material or services made directly in the compilation of the bid, which unintentional arithmetic error or unintentional omission can be clearly shown by objective evidence drawn from inspection of the original work paper, documents, or materials used in the preparation of the bid sought to be withdrawn; and
- (e) It is possible to place the agency in the same position as existed prior to the bid.

(2) Unless otherwise required by law, the sole remedy for a bid mistake in accordance with this Article shall be withdrawal of the bid, and the return of the bid bond or other security, if any, to the bidder. Thereafter, the agency may, in its discretion, award the Contract to the next lowest bidder or rebid the Contract. Any amendment to or reformation of a bid or a Contract to rectify such an error or mistake therein is strictly prohibited.

(3) If the mistake and the intended correct bid are clearly evident on the face of the bid document, the bid shall be corrected to the intended correct bid and may not be withdrawn. Examples of mistakes that may be corrected are typographical errors, errors in extending unit prices, transposition errors and arithmetical errors.

20. Low Tie Bids

(A) When two or more low responsive bids from responsible bidders are identical in price, meeting all the requirements and criteria set forth in the Invitation For Bids, the Agency Chief Contracting Officer will break the tie in the following manner and order of priority:

- (1) Award to a certified New York City small, minority or woman-owned business entity bidder;
- (2) Award to a New York City bidder;
- (3) Award to a certified New York State small, minority or woman-owned business bidder;
- (4) Award to a New York State bidder.

(B) If two or more bidders still remain equally eligible after application of paragraph (A) above, award shall be made by a drawing by lot limited to those bidders. The bidders involved shall be invited to attend the drawing. A witness shall be present to verify the drawing and shall certify the results on the bid tabulation sheet.

21. Rejection of Bids

(A) Rejection of Individual Bids: The Agency may reject a bid if:

- (1) The bidder fails to furnish any of the information required pursuant to Section 24 or 28 hereof; or if
- (2) The bidder is determined to be not responsible pursuant to the Procurement Policy Board Rules; or if
- (3) The bid is determined to be non-responsive pursuant to the Procurement Policy Board Rules; or if
- (4) The bid, in the opinion of the Agency Chief Contracting Officer, contains unbalanced bid prices and is thus non-responsive, unless the bidder can show that the prices are not unbalanced for the probable required quantity of items, or if the imbalance is corrected pursuant to Section 15.

(B) Rejection of All Bids: The Agency, upon written approval by the Agency Chief Contracting Officer, may reject all bids and may elect to resolicit bids if in its sole opinion it shall deem it in the best interest of the City so to do.

(C) Rejection of All Bids and Negotiation With All Responsible Bidders: The Agency Head may determine that it is appropriate to cancel the Invitation For Bids after bid opening and before award and to complete the acquisition by negotiation. This determination shall be based on one of the following reasons:

- (1) All otherwise acceptable bids received are at unreasonable prices, or only one bid is received and the Agency Chief Contracting Officer cannot determine the reasonableness of the bid price, or no responsive bid has been received from a responsible bidder; or
- (2) In the judgment of the Agency Chief Contracting Officer, the bids were not independently arrived at in open competition, were collusive, or were submitted in bad faith.

(D) When the Agency has determined that the Invitation for Bids is to be canceled and that use of negotiation is appropriate to complete the acquisition, the contracting officer may negotiate and award the Contract without issuing a new solicitation, subject to the following conditions:

- (1) prior notice of the intention to negotiate and a reasonable opportunity to negotiate have been given by the contracting officer to each responsible bidder that submitted a bid in response to the Invitation for Bids;
- (2) the negotiated price is the lowest negotiated price offered by a responsible bidder; and
- (3) the negotiated price is lower than the lowest rejected bid price of a responsible bidder that submitted a bid in response to the Invitation for Bids.

22. Right to Appeal Determinations of Non-Responsiveness or Non-Responsibility and Right to Protest Solicitations and Award

The bidder has the right to appeal a determination of non-responsiveness or non-responsibility and has the right to protest a solicitation and award. For further information concerning these rights, the bidder is directed to the Procurement Policy Board Rules.

23. Affirmative Action and Equal Employment Opportunity

This Invitation For Bids is subject to applicable provisions of Federal, State and Local Laws and executive orders requiring affirmative action and equal employment opportunity.

24. VENDEX Questionnaires

(A) Requirement: Pursuant to Administrative Code Section 6-116.2 and the PPB Rules, bidders may be obligated to complete and submit VENDEX Questionnaires. Generally, if this bid is \$100,000 or more, or if this bid when added to the sum total of all contracts, concessions and franchises the bidder has received from the City and any subcontracts received from City contractors over the past twelve months, equals or exceeds \$100,000, Vendex Questionnaires must be completed. If required, Vendex Questionnaires must be completed and submitted before any award of contract may be made or before approval is given for a proposed subcontractor. Non-compliance with these submission requirements may result in the disqualification of the bid, disapproval of a subcontractor, subsequent withdrawal of approval for the use of an approved subcontractor, or the cancellation of the contract after its award.

(B) Submission: Vendex Questionnaires must be submitted directly to the Mayor's Office of Contract Services, ATTN: Vendex, 253 Broadway, 9th Floor, New York, New York 10007. In addition, the bidder must submit a Confirmation of Vendex Compliance to the agency. A form for this confirmation is set forth in the Bid Booklet.

(C) Obtaining Forms: Vendex Questionnaires, as well as detailed instructions, may be obtained at www.nyc.gov/vendex. The bidder may also obtain Vendex forms and instructions by contacting the Agency Chief Contracting Officer or the contact person for this contract.

25. Complaints About the Bid Process

The New York City Comptroller is charged with the audit of contracts in New York City. Any vendor who believes that there has been unfairness, favoritism or impropriety in the bid process should inform the Comptroller, Office of Contract Administration, One Centre Street, Room 835, New York, New York; telephone number (212)669-2797.

26. Bid, Performance and Payment Security

(A) Bid Security: Each bid must be accompanied by bid security in an amount and type specified in Attachment 1. The bid security shall assure the City of New York of the adherence of the bidder to its proposal, the execution of the Contract, and the furnishing of Performance and Payment Bonds by the bidder, if required in Attachment 1. Bid security shall be returned to the bidder as follows:

- (1) Within ten (10) days after the bid opening, the Comptroller will be notified to return the deposits of all but the three (3) lowest bidders. Within five (5) days after the award, the Comptroller will be notified to return the deposits of the remaining two unsuccessful bidders;
- (2) Within five (5) days after the execution of the Contract and acceptance of the Contractor's bonds, the Comptroller will be notified to return the bid security of the successful bidder or, if performance and payment bonds are not required, only after the sum retained under Article 21 of the Contract equals the amount of the bid security.
- (3) Where all bids are rejected, the Comptroller will be notified to return the deposit of the three (3) lowest bidders at the time of rejection.

(B) Performance and Payment Security: Performance and Payment Security must be provided in an amount and type specified in Attachment 1. The performance and payment security shall be delivered by the contractor prior to or at the time of execution of the Contract. If a contractor fails to deliver the required performance and payment security, its bid security shall be enforced, and an award of Contract may be made to the next lowest responsible and responsive bidder, or the contract may be rebid.

(C) Acceptable Types of Security: Acceptable types of security for bids, performance, and payment shall be limited to the following:

- (1) a one-time bond in a form satisfactory to the City;
- (2) a bank certified check or money order;
- (3) obligations of the City of New York; or
- (4) other financial instruments as determined by the Office of Construction in consultation with the Comptroller.

Whenever the successful bidder deposits obligations of the City of New York as performance and payment security, the Comptroller may sell and use the proceeds thereof for any purpose for which the principal or surety on such bond would be liable under the terms of the Contract. If the money is deposited with the Comptroller, the successful bidder shall not be entitled to receive interest on such money from the City.

(D) Form of Bonds: Security provided in the form of bonds must be prepared on the form of bonds authorized by the City of New York. Forms for bid, performance, and payment bonds are included in the Invitation for Bids Documents. Such bonds must have as surety thereunder such surety company or companies as are: (1) approved by the City of New York; (2) authorized to do business in the State of New York, and (3) approved by the Department of the Treasury of the United States. Premiums for any required bonds must be included in the base bid.

The bidder is advised that submission of a bid bond where the surety on such bond fails to meet the criteria set forth herein, shall result in the rejection of the bid as non-responsive.

The Department of the Treasury of the United States advises that information concerning approved surety companies may be obtained as follows: (1) from the Government Printing Office at 202-512-1800; (2) through the Internet at <http://www.fns.treas.gov/c570/index.html>, and (3) through a computerized public bulletin board, which can be accessed by using your computer modem and dialing 202-874-6887.

(E) **Power of Attorney:** Attorneys in fact who sign bid, performance, or payment bonds must file with each bond a certified copy of their power of attorney to sign said bonds.

27. **Failure to Execute Contract**

In the event of failure of the successful bidder to execute the Contract and furnish the required security within ten (10) days after notice of the award of the Contract, the deposit of the successful bidder or so much thereof as shall be applicable to the amount of the award made shall be retained by the City, and the successful bidder shall be liable for and hereby agrees to pay on demand the difference between the price bid and the price for which such Contract shall be subsequently awarded, including the cost of any required reletting and less the amount of such deposit. No plea of mistake in such accepted bid shall be available to the bidder for the recovery of the deposit or as a defense to any action based upon such accepted bid. Further, should the bidder's failure to comply with this Section cause any funding agency, body or group (Federal, State, City, Public, Private, etc.) to terminate, cancel or reduce the funding on this project, the bidder in such event shall be liable also to the City for the amount of actual funding withdrawn by such agency on this project, less the amount of the forfeited deposit.

28. **Bidder Responsibilities and Qualifications**

(A) Bidders must include with their bids all information necessary for a determination of bidder responsibility, as set forth in the Specifications.

(B) The Agency may require any bidder or prospective bidder to furnish all books of account, records, vouchers, statements or other information concerning the bidder's financial status for examination as may be required by the Agency to ascertain the bidder's responsibility and capability to perform the Contract. If required, a bidder must also submit a sworn statement setting forth such information as the Agency may require concerning present and proposed plant and equipment, the personnel and qualifications of his working organizations, prior experience and performance record.

(C) **Oral Examination on Qualifications:** In addition thereto, and when directed by the Agency, the bidder, or a responsible officer, agent or employee of the bidder, must submit to an oral examination to be conducted by the Agency in relation to his proposed tentative plan and schedule of operations, and such other matters as the Agency may deem necessary in order to determine the bidder's ability and responsibility to perform the work in accordance with the Contract. Each person so examined must sign and verify a stenographic transcript of such examination noting thereon such corrections as such person may desire to make.

(D) If the bidder fails or refuses to supply any of the documents or information set forth in paragraph (B) hereof or fails to comply with any of the requirements thereof, the Agency may reject the bid.

29. **Employment Report**

In accordance with Executive Order No. 50 (1980) as modified by Executive Order 108 (1986), the filing of a completed Employment Report (ER) is a requirement of doing business with the City of New York for construction contractors with contracts of \$1,000,000 or more and subcontractors with construction subcontracts of \$750,000 or more. The required forms and information are included in the Bid Booklet.

30. **Labor Law Requirements**

(A) **General:** The successful bidder will be required to comply strictly with all Federal, State and local labor laws and regulations.

(B) New York State Labor Law: This Contract is subject to New York State Labor Law Section 220, which requires that construction workers on the site be paid prevailing wages and supplements. The Contractor is reminded that all wage provisions of this Contract will be enforced strictly and failure to comply will be considered when evaluating performance. Noncompliance may result in the contractor being debarred by the City from future contracts. Complaints filed with the Comptroller may result in decisions which may debar a contractor from bidding contracts with any state governmental entity and other political subdivisions.

(C) Records: The Contractor is expected to submit accurate payroll reports and other required documents and verify attendance and job classifications being utilized in compliance with the law, Contract provisions and agency procedures.

31. Insurance

(A) Bidders are advised that the insurance requirements contained herein are regarded as material terms of the Contract. As required by Article 22 of the Contract, the contractor must effect and maintain with companies licensed and authorized to do business in the State of New York, the types of insurance set forth therein, when required by and in the amounts set forth in Schedule A of the General Conditions. Such required insurance must be provided from the date the contractor is ordered to commence work and up to the date of final acceptance of all required work.

(B) The contractor must, within ten days of receipt of the notice of award, submit the following insurance documentation: (a) original certificate of insurance for general liability in the amount required by Schedule A of the General Conditions, and (b) original certificates of insurance or other proof of coverage for workers' compensation and disability benefits, as required by Section 57 of the New York State Workers' Compensation Law and Section 220 of the Disability Benefits Law.

32. Lump Sum Contracts

(A) Comparison of Bids: Bids on Lump Sum Contracts will be compared on the basis of the lump sum price bid, adjusted for alternate prices bid, if any.

(B) Lump Sum Bids for "General Construction Work" which include excavation shall include all necessary excavation work defined in the Specifications as being included in the lump sum bid. The bidder shall also bid a unit price for the additional cost of excavating material which is defined in the Specifications as excavation for which additional payment will be made. The total estimated additional cost of removing such material will be taken as the quantity set forth in the Engineer's Estimate multiplied by the unit price bid. This total estimated cost of additional excavation shall be added to the lump sum bid for the General Construction Work for the purpose of comparing bids to determine the low bidder.

(C) Variations from Engineer's Estimate: The Engineer's Estimate of the quantity of excavation for which additional payment will be made is approximate only and is given solely to be used as a uniform basis for the comparison of bids and such estimate is not to be considered as part of this contract. The quantities actually required to complete the contract work may be more or less than the quantities in the Engineer's Estimate and, if so, no action for damages or for loss of profits shall accrue to the contractor by reason thereof.

33. Unit Price Contracts

(A) Comparison of Bids: Bids on Unit Price Contracts will be compared on the basis of a total estimated price, arrived at by taking the sum of the estimated quantities of such items, in accordance with the Engineer's Estimate of Quantities set forth in the Bid Form, multiplied by the corresponding unit prices, and including any lump sum bids on individual items.

(B) Variations from Engineer's Estimate: Bidders are warned that the Engineer's Estimate of Quantities on the various items of work and materials is approximate only, given solely to be used as a uniform basis for the comparison of bids, and is not be considered part of this contract. The quantities actually required to complete the contract work may be less or more than so estimated, and if so, no action for damages or for loss of profits shall accrue to the contractor by reason thereof.

(C) Overruns: The terms and conditions applicable to overruns of unit price items are set forth in Article 26 of the Contract.

34. Excise Tax

Bidders are referred to the Specifications for information on Federal Excise Tax exemptions.

35. Licenses and Permits

The successful bidder will be required to obtain all necessary licenses and permits necessary to perform the work.

36. Multiple Prime Contractors

If more than one prime contractor will be involved on this project, all contractors are required to examine the Invitation for Bid packages for all other parts of the project.

37. Locally Based Enterprise Requirements (LBE)

This Contract is subject to the requirements of Administrative Code, Section 6-108.1, and the regulations promulgated thereunder. No construction contract will be awarded unless and until these requirements have been complied with in their entirety. The bidder is advised of the provisions set forth below, as well as the provisions with respect to the Locally Based Enterprise Program contained in Article 67 of the Contract. The contractor is advised that:

(A) If any portion of the Contract is subcontracted, not less than ten percent of the total dollar amount of the contract shall be awarded to locally based enterprises ("LBEs"); except, where less than ten percent of the total dollar amount of the Contract is subcontracted, such lesser percentage shall be so awarded.

(B) No contractor shall require performance and payment bonds from LBE subcontractors.

(C) No Contract shall be awarded unless the contractor first identifies in its bid:

- (1) the percentage, dollar amount and type of work to be subcontracted; and
- (2) the percentage, dollar amount and type of work to be subcontracted to LBEs.

(D) Within ten calendar days after notification of low bid, the apparent low bidder shall submit an "LBE Participation Schedule" to the contracting agency. If such schedule does not identify sufficient LBE subcontractors to meet the requirements of Administrative Code Section 6-108.1, the apparent low bidder shall submit documentation of its good faith efforts to meet such requirements.

(1) The "LBE Participation Schedule" shall include:

- (a) the name and address of each LBE that will be given a subcontract,
- (b) the percentage, dollar amount and type of work to be subcontracted to the LBE, and
- (c) the dates when the LBE subcontract work will commence and end.

- (2) The following documents shall be attached to the "LBE Participation Schedule":
- (a) verification letters from each subcontractor listed in the "LBE Participation Schedule" stating that the LBE will enter into a formal agreement for work,
 - (b) certification documents of any proposed LBE subcontractor which is not on the LBE certified list, and
 - (c) copies of the certification letter of any proposed subcontractor which is an LBE.
- (3) Documentation of good faith efforts to achieve the required LBE percentage shall include as appropriate but not limited to the following:
- (a) attendance at prebid meetings, when scheduled by the agency, to advise bidders of contract requirements;
 - (b) advertisement where appropriate in general circulation media, trade association publications and small business media of the specific subcontracts that would be at least equal to the percentage goal for LBE utilization specified by the contractor;
 - (c) written notification to association of small, minority and women contractors soliciting specific subcontractors;
 - (d) written notification by certified mail to LBE firms that their interest in the contract is solicited for specific work items and their estimated values;
 - (e) demonstration of efforts made to select portions of the work for performance by LBE firms in order to increase the likelihood of achieving the stated goal;
 - (f) documented efforts to negotiate with LBE firms for specific subcontracts, including at a minimum:
 - (i) The names, address and telephone numbers of LBE firms that are contacted;
 - (ii) A description of the information provided to LBE firms regarding the plans and specifications for portions of the work to be performed;
 - (iii) Documentation showing that no reasonable price can be obtained from LBE firms;
 - (iv) A statement of why agreements with LBE firms were not reached;
 - (g) a statement of the reason for rejecting any LBE firm which the contractor deemed to be unqualified; and
 - (h) documentation of efforts made to assist the LBE firms contacted that needed assistance in obtaining required insurance.

(E) Unless otherwise waived by the Commissioner with the approval of the Office of Economic and Financial Opportunity, failure of a proposed contractor to provide the information required by paragraphs (C) and (D) above may render the bid non-responsive and the Contract may not be awarded to the bidder. If the contractor states that it will subcontract a specific portion of the work, but can demonstrate despite good faith efforts it cannot achieve its required LBE percentage for subcontracted work until after award of Contract, the Contract may be awarded, subject to a letter of compliance from the contractor stating that it will comply with Administrative Code Section 6-108.1 and subject to approval by the Commissioner. If the contractor has not met its required LBE percentage prior to award, the contractor shall demonstrate that a good faith effort has been made subsequent to award to obtain LBEs on each subcontract until it meets the required percentage.

(F) When a bidder indicates prior to award that no work will be subcontracted, no work may be subcontracted without the prior written approval of the Commissioner, which shall be granted only if the contractor in good faith seeks LBE subcontractors at least six weeks prior to the start of work.

(G) The contractor may not substitute or change any LBE which was identified prior to award of the contract without the written permission of the Commissioner. The contractor shall make a written application to the Commissioner for permission to make such substitution or change, explaining why the contractor needs to change its LBE subcontractor and how the contractor will meet its LBE subcontracting requirement. Copies of such application must be served on the originally identified LBE by certified mail return receipt requested, as well as the proposed substitute LBE. The Commissioner shall determine whether or not to grant the contractor's request for substitution.

38. Bid Submission Requirements

The Bid Submission Requirements are set forth on page 2 of the Bid Booklet.

39. Comptroller's Certificate

This Contract shall not be binding or of any force unless it is registered by the Comptroller in accordance with Section 328 of the City Charter and the Procurement Policy Board Rules. This Contract shall continue in force only after annual appropriation of funds by the City of New York and certification as hereinabove set forth.

40. Procurement Policy Board Rules

This Invitation For Bids is subject to the Rules of the Procurement Policy Board of the City of New York. In the event of a conflict between said Rules and a provision of this Invitation For Bids, the Rules shall take precedence.

41. DDC Safety Requirements

The DDC Safety Requirements apply to the work to be performed pursuant to the Contract. The DDC Safety Requirements are set forth on the following pages.

CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
SAFETY REQUIREMENTS

THE DDC SAFETY REQUIREMENTS INCLUDE THE FOLLOWING SECTIONS:

- I. POLICY ON SITE SAFETY**
- II. PURPOSE**
- III. DEFINITIONS**
- IV. RESPONSIBILITIES**
- V. SAFETY QUESTIONNAIRE**
- VI. SAFETY PROGRAM AND SITE SAFETY PLAN**
- VII. KICK-OFF/PRE-CONSTRUCTION MEETINGS AND SAFETY REVIEW**
- VIII. EVALUATION DURING WORK IN PROGRESS**
- IX. SAFETY PERFORMANCE EVALUATION**

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I. POLICY ON SITE SAFETY

The City of New York Department of Design and Construction (DDC) is committed to a policy of injury and illness prevention and risk management for construction work that will ensure the safety and health of the workers engaged in the projects and the protection of the general public. Therefore, it is DDC's policy that work carried out by Contractors on DDC jobsites must, at a minimum, comply with applicable federal, state and city laws, rules and regulations, including without limitation:

- ❑ U. S. Department of Labor 29 Code of Federal Regulations (CFR) Part 1926 and applicable Sub-parts of Part 1910 – U.S. Occupational Safety and Health Administration (OSHA) including, but not limited to “Respiratory Protection” (29 CFR 1910.134), “Permit-Required Confined Spaces” (29 CFR 1910.146), and “Hazard Communication” (29 CFR 1910.1200);
- ❑ New York State Department of Labor Industrial Code Rule 23 – Protection in Construction, Demolition and Excavation;
- ❑ New York City Construction Codes, Title 28
- ❑ NYC Department of Transportation Title 34 Chapter 2 – Highway Rules
- ❑ New York State Department of Labor Industrial Code Rule 753
- ❑ NYC Local Law No. 113 (2005) Noise Control Code

In addition, all regulations promulgated by the NYC Department of Transportation, including requirements for Maintenance and Protection of Traffic (MPT), are applicable when contained in contract specifications. While MPT is a significant component of work in our Infrastructure Division, it does not supersede or exempt Contractors from complying with other applicable health and safety standards (for example, excavating and trenching standards, operation of heavy equipment and compliance with City environmental and noise regulations).

I. PURPOSE

The purpose of this policy is to ensure that Contractors perform their work and supervise their employees in accordance with all applicable federal, state and city rules and regulations. Further, Contractors will be expected to minimize or eliminate jobsite and public hazard, through a planning, inspection, auditing and corrective action process. The goal is to control risks so that injuries, illnesses and accidents to contractors' employees, DDC employees and the general public, as well as damage to city-owned and private property, are reduced to the lowest level feasible.

III. DEFINITIONS

Agency Chief Contracting Officer (ACCO): The ACCO shall mean the person delegated authority by the Commissioner to organize and supervise the procurement activity of subordinate Agency staff in conjunction with the CCPO.

Competent Person: As defined by OSHA, an individual who is capable of identifying existing and predictable hazards in the surroundings or working conditions that are unsanitary, hazardous, or dangerous to employees or the general public, and who has authorization to take prompt corrective measures to eliminate them.

Construction Safety Auditor: A representative of the QACS Construction Safety Unit who provides inspection and assessment services to enhance health and safety on all DDC construction projects. The activities of the Construction Safety Auditor include performing site surveys, reviewing health and safety plans, reviewing construction permits, and rendering technical advice and assistance to DDC Resident Engineers and Project Managers.

Construction Safety Unit: A part of QACS within the Division of Technical Support that assesses contractor safety on DDC jobsites and advises responsible parties of needed corrective actions.

Construction Superintendent: A representative of the contractor responsible for overseeing performance of the required construction work. This individual must engage in sound construction practices, and is responsible to maintain a safe work site. In the case of a project involving the demolition, alteration or new construction of buildings, the Construction Superintendent must be licensed by the NYC Department of Buildings.

Contractor: For purposes of these Safety Requirements, the term "Contractor" shall mean any person or entity that enters into a contract for the performance of construction work on a DDC project. The term "Contractor" shall include any person or entity which enters into any of the following types of contracts: (1) a prime construction contract for a specific project, (2) a prime construction contract using the Job Order Contracting System ("JOCS Contract"), and (3) a subcontract with a CM/Builder ("First Tier Subcontract").

Director - Quality Assurance and Construction Safety (QACS): Responsible for the operations of the QACS Construction Safety Unit and the DDC Site Safety management programs.

Job Hazard Assessment (JHA): A process of identifying site-specific hazards that may be present during construction and establishing the means and methods to reduce or eliminate those hazards.

Jobsite Safety Coordinator: A person designated by the Contractor to be onsite during all activities. This individual shall have received, at a minimum, the OSHA 10-hour construction safety program. Other examples of acceptable training are the 30-hour OSHA Safety and Health Standards for the Construction Industry training program (OSHA 510) or a degree/certificate in a safety and health from a college-level curriculum. This person does not necessarily have to be dedicated full-time to site safety, but must have sufficient experience and authority to undertake corrective action and must qualify to be a competent person. For certain projects, as defined in NYC Construction Codes - Title 28, this person may be required to have a Site Safety Manager's License issued by the NYC DOB.

Qualified Person: As defined by OSHA, an individual who, by possession of a recognized degree, certificate, license or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated his or her ability to solve problems relating to the subject matter, the work, or the project. Qualified Persons are required under regulation to address issues pertaining, but without limit, to fall protection, scaffold design and trenching and shoring, among others.

Resident Engineer (RE) / Construction Project Manager (CPM): Representative of the Commissioner duly designated by the Commissioner to be his/her representative at the site of the work. (The RE/CPM may be a third-party consultant, including a CM, retained by DDC.)

Safety Program: Established by the Contractor that covers all operations of that Contractor and establishes the Contractor's overall safety policy, regulatory compliance plan and minimum safety standards. The Safety Program must be submitted prior to the commencement of work at the site and is subject to review and acceptance by the Construction Safety Unit.

Safety Questionnaire: Used by DDC to evaluate Contractor's current and past safety performance. It is required to be completed by all Contractors initially when submitting bids for Construction work, or when being pre-qualified and updated annually or as requested by the DDC.

Site Safety Plan: A site-specific safety plan developed by the Contractor for a specific project. The Site Safety Plan must identify hazards associated with the project, and include specific safety precautions and training appropriate and necessary to complete the work. The Site Safety Plan must be submitted prior to the commencement of work at the site and is subject to review and acceptance by the Construction Safety Unit.

Unsafe or Unhealthy Condition: A condition that could be potentially hazardous to the health and safety of personnel or the public, and/or damaging to equipment, machinery, property or the environment.

Weekly Safety Meetings: Weekly documented jobsite safety meetings, given to all jobsite personnel by contractor, with the purpose of discussing general safety topics and job specific requirements encountered at the DDC work site.

IV. RESPONSIBILITIES

All persons who manage, perform, and provide support for construction projects shall conduct operations in compliance with the requirements identified in this Policy and all applicable governing regulatory agency requirements and guidelines pertaining to safety in construction.

A. Resident Engineer / Construction Project Manager / Construction Manager

- Monitors the issuance of safety-related permits, approvals and drawings and maintains copies on site.
- Monitors construction-related work activities to confirm that they are conducted in accordance with DDC policies and all applicable regulations that pertain to construction safety.
- Maintains documentation and periodically attends weekly safety meeting.
- Notifies the Construction Safety Unit and the ACCO's Insurance and Risk Management Unit of project-related accidents and emergencies, as per DDC's Construction Safety Emergency Protocol.
- Gathers facts related to all accidents and prepares DDC Accident Reports.
- Notifies the Construction Safety Unit of outside regulatory agency inspections and forwards a copy of the inspection report within three days of its receipt.
- Monitors the conditions at the site for conformance with the Site Safety Plan and DDC construction documents.
- Notifies the contractor and DDC in the event that any condition or activity exists that is not in compliance with the Site Safety Plan, applicable federal, state or local codes or any condition that presents a potential risk of injury to the public or workers or possible damage to property.
- Notifies DDC of any emergency condition and directs the contractor to provide such labor, materials, equipment and supervision to abate such conditions.
- Reports gross safety violations to the Construction Safety Unit immediately.

A. Contractors

- Complete a Safety Questionnaire and submit with its bid or as part of a pre-qualification package.
- Provide a Written Job Hazard Assessment (JHA) that identifies expected safety issues of the work to be performed. JHA shall be included with the Site Safety Plan submitted by the contractor.
- Submit a Site Safety Plan and Safety Program within 15 days of issuance of the Notice to Proceed, or as otherwise directed. The Site Safety Plan and Safety Program are subject to review and acceptance by the Construction Safety Unit prior to the commencement of work at the site. The Site Safety Plan shall be revised and updated as necessary.
- Ensure that all employees are aware of the hazards associated with the project through formal and informal training and/or other communications. Conduct and document weekly safety meetings for the duration of the project. Documentation to be provided to the RE/CPM/CM on a monthly basis.
- Name a Construction Superintendent, if required.
- Name a Job Site Safety Coordinator. The Contractor will be required to identify the Job Site Safety Coordinator in the Site Safety Plan.
- Comply with all mandated federal, state and local safety and health rules and regulations.
- Comply with all provisions of the Site Safety Plan.
- As part of the Site Safety Plan, prepare a site specific MPT (if not otherwise provided in the contract documents) and comply with all of its provisions.
- Conduct and document site-specific safety orientation for Contractor personnel to review the hazards associated with the project as identified in the Site Safety Plan and the specific safety procedures and controls that will be used to protect workers, the general public and property. The Job Site Safety Coordinator will conduct this training prior to mobilization and provide documentation to the RE/CPM/CM.
- Provide, replace and adequately maintain at or around the project site, suitable and sufficient signage, lights, barricades and enclosures (fences, sidewalk sheds, netting, bracing, etc.).
- Report unsafe conditions or hazards to the DDC RE/CPM/CM as soon as practical, but no more than 24 hours after discovery, and take action to remove or abate such conditions.

- Report any accident involving injuries to workers or the general public, as well as property damage, to the DDC RE/CPM/CM within two (2) hours.
- Notify the DDC RE/CPM/CM within two (2) hours of the start of an inspection by any regulatory agency personnel, including OSHA.
- Maintain all records pertaining to all required compliance documents and accident and injury reports.
- Respond to DDC recommendations on safety, which shall in no way relieve the Contractor of its responsibilities for safety on the project. The Contractor has sole responsibility for safety.

V. SAFETY QUESTIONNAIRE

DDC requires that all Contractors provide information regarding their current and past safety and environmental performance and programs. This will be accomplished by the use of the DDC Safety Questionnaire. As a part of the bid submittal package, the contractor must submit a completed DDC Safety Questionnaire listing their workers' compensation experience modification rating and OSHA Incidence Rates for the three (3) years prior to the date of the bid opening. DDC may request a Contractor to update its Questionnaire at any time or to provide more detailed information. The Contractor must provide the requested update within 30 days.

The following criteria will be used by DDC in reviewing the Contractor's responsibility, which will be based on the information provided on the questionnaire:

- Criteria 1: OSHA Injury and Illness Rates (I&IR) are no greater than the average for the industry (based on the most current Bureau of Labor Statistics data for the Contractors SIC code); and
- Criteria 2: Insurance workers compensation Experience Modification Rate (EMR) equal to or less than 1.0; and
- Criteria 3: Any willful violations issued by OSHA or NYC DOB within the last three years; and
- Criteria 4: A fatality (worker or member of public) experienced on or near Contractor's worksite within the last three (3) years; and
- Criteria 5: An unacceptable rating by QACS based on past performance on DDC projects; and
- Criteria 6: Contractor has in place an acceptable corporate safety program and its employees shall have completed all documented relative safety training; and
- Criteria 7: Contractor shall provide OSHA Injury Records (currently OSHA 300 Log) for the last three (3) years.

If the Contractor fails to meet the basic criteria listed above, the Construction Safety Unit may request, through the ACCO, more detail concerning the Contractor's safety experience. DDC may request the Contractor to provide copies of, among other things, OSHA records, OSHA and DOB citations, EPA citations and written Safety Programs.

VI. SAFETY PROGRAM AND SITE SAFETY PLAN

Within fifteen (15) days of issuance of the Notice to Proceed, or as otherwise directed, the Contractor shall submit the following: (1) Safety Program, and (2) Site Safety Plan. The Safety Program shall set forth the Contractor's overall safety policy, regulatory compliance plan and minimum safety standard, and the Site Safety Plan shall identify hazards associated with the project, and include specific safety precautions and training appropriate and necessary to complete the work. The Safety Program and the Site Safety Plan are subject to review and acceptance by the Construction Safety Unit prior to the commencement of work at the site. Failure by the contractor to submit an acceptable Site Safety Plan and Safety Program shall be grounds for default.

The Site Safety Plan shall apply to all Contractor and subcontractor operations, and shall have at a minimum, the following elements. Each element shall be described in a separate section in the written document. It may be necessary to modify the basic format for certain unique or high-risk projects (such as tunnels or high-rise construction). The basic elements are as follows:

1. **Responsibility and Organization:** Identify the person or persons with authority and responsibility for implementing the Site Safety Plan. Provide an organization chart and define levels of authority and responsibility. Identify the Competent Person, the Construction Superintendent (if required), the Job Safety Coordinator and the Qualified Person required for this project.
2. **Communication:** Establish a system for communicating with employees and subcontractors on matters relating to worker and public safety and health and environmental protection, including provisions designed to encourage employees to inform the employer of hazards at the worksite without fear of reprisal. An emergency response notification protocol is to be established that also includes after hours contact numbers. The plan must also include provisions for weekly safety meetings held by the Job Site Safety Coordinator.
3. **Job Hazard Assessment:** A written document submitted by the contractor, used to identify expected job hazards and public safety risks and state the specific means and methods to reduce, control or eliminate those hazards. This part of the Site Safety Plan must also include how on-going evaluations of those risks and hazards will be carried out, including plans for periodic inspections to identify unsafe conditions, work practices and public safety hazards.
4. **Accident/Exposure Investigation:** Establish a procedure to investigate and report occupational and public injury or illness, property damage, vehicle accidents or other mishaps.
5. **Hazard Correction:** Establish means, methods and/or procedures for correcting unsafe or unhealthy conditions that might be exposing both the public and workers to hazards. Corrective actions must be taken immediately when observed or discovered. Should an imminent hazard exist which cannot be immediately abated without endangering employees, the public and/or property, remove or restrict all exposed persons from the area except those necessary to correct the existing condition. Employees necessary to correct the hazardous condition shall be provided the necessary safeguards. When corrective actions cannot be taken immediately, temporary measures should be taken until such time permanent measures are taken to eliminate the potential risks or hazards
6. **Training:** Describe site-specific hazard training programs. In addition to the required safety orientation, additional site specific training, in the form of required weekly safety meetings, will be required. Contractors must also initiate training when: a) new employees are hired; b) employees are given new job assignments for which training has not been previously received; c) new substances, processes, procedures or equipment are introduced that might represent a new public or worker hazard; d) the employee is made aware of a new or previously unrecognized hazard; e) new supervisors are assigned to familiarize themselves with the safety and health hazards to which employees under their immediate direction and control may be exposed; and f) after a jobsite incident or accident has occurred.
7. **Recordkeeping:** Establish procedures to maintain records of scheduled and periodic inspections, weekly safety meetings, and training records. Updated records shall be maintained at the jobsite, accessible to the Construction Safety Auditors and/or Quality Assurance Auditors/RE/CPM, and retained in accordance with DDC policy.

The most critical component of the Site Safety Plan is the Job Hazard Assessment section. This section must address specific hazards that are anticipated throughout the project. Each Site Safety Plan must address, at a minimum:

- Public and pedestrian safety
- Fall protection
- Electrical hazards
- Scaffolding
- Fire protection
- Emergency notification & response
- Housekeeping / debris removal
- Dust control
- Maintenance and protection of traffic
- Trenching and excavating
- Heavy equipment operations
- Material / equipment storage
- Environmental contamination
- Sheeting and shoring
- Alcohol and Drug Abuse Policy

The following additional hazards must be addressed, if applicable, based on the contract safety specifications and/or the results of the JHA (the list is not all-inclusive):

- Basic Personal Protective Equipment
- Compressed Air
- Compressed Gas Cylinders
- Cranes, Derricks and Hoists
- Demolition
- Electrical safety
- Excavations and Trenching
- Fall Protection – Floor openings/Stairways
- Fall Protection – Guardrails Toe boards etc
- Fall Protection – Leading Edge
- Fall Protection – Personal Fall Protection Devices
- Fire Protection and Fire Prevention
- Hazard Communication (RIGHT TO KNOW)
- Hazardous Energy & Lock Out / Tag Out
- Housekeeping/ Sanitation
- Maintenance and Protection of Traffic (MPT)
- Man Lifts /Aerial Lifts
- Marine Operations
- Motor Vehicle Safety
- Overhead Power lines
- Permit Required Confined Space
- Portable Ladders
- Powered Actuated Tools
- Powered Material Handling Equipment
- Scaffolds – Mobile
- Scaffolds – Stationary
- Scaffolds – Suspended
- Slings
- Steel Erection
- Welding and Cutting (Hot Work)
- Airborne Contaminants – Particulates – General
- Asbestos
- Blood borne Pathogens
- Hearing Protection
- Lead in Construction
- Mercury in Construction
- PCB's
- Respiratory Protection
- Silica
- Thermal Stress
- West Nile Virus
- Rodents and Vermin
- Noise Mitigation Plan

Certain DDC programs, such as Job Order Contracting System (JOCS), may not necessarily require Site Safety Plans. The JOCS contractor will be required to submit a Safety Program. In addition, certain DDC Operating Units may establish program or client-specific safety requirements. The contractor's Site Safety Plan must address such program or client specific safety requirements.

VII. KICK-OFF MEETINGS/PRE-CONSTRUCTION AND SAFETY REVIEW

As part of the construction kick-off meeting, a Site Safety Plan review will be part of the agenda. A QACS representative will participate in this meeting with the contractor prior to the start of the project for the purpose of:

- A. Reviewing the safety issues detailed in the contract.
- B. Reviewing the Site Safety Plan.
- C. Reviewing any new issues or information that was not previously addressed.
- D. Discussing planned inspections and audits of the site by DDC personnel.

VIII. EVALUATION DURING WORK IN PROGRESS

The Contractor's adherence to these Safety Requirements will be monitored throughout the project. This will be accomplished by the following:

- A. Use of a safety checklist by a representative of the Construction Safety Unit or other designated DDC representative or Consultant during regular, unannounced inspections of the job site. Field Exit Conferences will be held with the RE/CPM, Contractor Superintendents or Safety Representatives.
- B. The RE/CPM will continually monitor the safety and environmental performance of the contractor's employees and work methods. Deficiencies shall be brought to the attention of the contractor's representative on site for immediate correction. The DDC representative will maintain a written record of these deficiencies and forward them to the Construction Safety Unit on a weekly basis. Any critical deficiencies shall be immediately reported to QACS phone# (718) 391-1624 or (718) 391-1911.
- C. If the Contractor's safety performance during the project is not up to DDC standards (safety performance measure, accident/incident rate, etc.) the Director- QACS, or designee will meet with the Contractor's safety representative, the DDC project manager, the RE/CPM, or the DDC Environmental Specialist (if environmental issues are involved). The purpose of this meeting is to 1) determine the level of non-compliance; 2) explain and clarify the safety/environmental provisions; 3) agree on a future course of action to correct the deficiencies.
- D. If the deficiencies continue to occur with inadequate attention by the contractor, this shall, among other remedies available, be grounds for default.
- E. The contractor shall inform the Construction Safety Unit and ACCO Insurance and Risk Management Unit of all medical injuries or illnesses that require doctors' treatment resulting from an on-the-job incident within 24 hours of the occurrence. The Construction Safety Unit shall also be immediately informed of all fatalities, catastrophic accidents with more than one employee hospitalized, any injuries to members of the general public and major equipment damage (e.g., property damage, equipment rollovers, loads dropped from crane). QACS shall maintain a record of all contractor injuries and illnesses during the project and provide regular reports to the Agency.
- F. The Construction Safety Unit shall be immediately notified at the start of any NYS-DOL/ NYC-COSH/ OSHA/ EPA inspections. The Director of Quality Assurance & Construction Safety shall maintain a log of all contractor OSHA/EPA inspections and citations during the project.

IX. SAFETY PERFORMANCE EVALUATION

The contractor's safety record, including all DDC inspection results, will be considered as part of the Contractor's performance evaluation at the conclusion of the project. Poor safety performance during the course of the project shall be a reason to rate a Contractor unsatisfactory which will be reflected in the City's Vendex system and will be considered for future procurement actions as set forth in the City's Procurement Policy Board Rules.

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CITY OF NEW YORK
STANDARD CONSTRUCTION CONTRACT

September 2008



**CITY OF NEW YORK
STANDARD CONSTRUCTION CONTRACT**

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CITY OF NEW YORK

STANDARD CONSTRUCTION CONTRACT (September 2008)

The Standard Construction Contract dated September 2008 (the "Contract") is amended as set forth below.

- Article 77: Article 77, Part A, Section 5 is deleted in its entirety and replaced with the following:

5. Where a Subcontractor Utilization Plan has been submitted, the Contractor shall, within 30 days of issuance by Agency of a notice to proceed, submit a list of proposed persons or entities to which it intends to award subcontracts within the subsequent 12 months. In the case of multi-year contracts, such list shall also be submitted every year thereafter. **PLEASE NOTE: If this Contract is a public works project subject to GML §101(5), [i.e., a contract valued at or below \$3M (for projects in New York City) or a contract that is subject to a Project Labor Agreement] where the bidder is required to identify at the time of bid submission its intended subcontractors for the Wicks trades [i.e., plumbing and gas fitting; steam heating, hot water heating, ventilating and air conditioning (HVAC); and electric wiring], the Contractor must identify all those to which it intends to award construction subcontracts for any of the Wicks trades, regardless of what point in the life of the contract such subcontracts will occur, at the time of bid submission. In the event that the Contractor's selection of a subcontractor is disapproved, the Contractor shall have a reasonable time to propose alternate subcontractors.**

- Article 77: Article 77, Part A, Section 11 is deleted in its entirety and replaced with the following:

11. **Modification of Subcontractor Utilization Plan. A Contractor may request a modification of its Subcontractor Utilization Plan (Subcontractor Participation Goals) after award of this Contract. PLEASE NOTE: If this Contract is a public works project subject to GML §101(5), [i.e., a contract valued at or below \$3M (for projects in New York City) or a contract that is subject to a Project Labor Agreement] where the bidder is required to identify at the time of bid submission its intended subcontractors for the Wicks trades [i.e., plumbing and gas fitting; steam heating, hot water heating, ventilating and air conditioning (HVAC); and electric wiring], the Contractor may request a Modification of its Subcontractor Utilization Plan as part of its bid submission. The Agency may grant a request for Modification of a Contractor's Subcontractor Utilization Plan if it determines that the Contractor has established, with appropriate documentary and other evidence, that it made reasonable, good faith efforts to meet the Subcontractor Participation Goals. In making such determination, Agency shall consider evidence of the following efforts, as applicable, along with any other relevant factors:**

Sub-paragraphs (a) through (h) remain unchanged.

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WITNESSETH:

The parties in consideration of the mutual agreements contained herein, agree as follows:

**CHAPTER I
THE CONTRACT AND DEFINITIONS**

ARTICLE 1. THE CONTRACT

1.1 Except for titles, subtitles, headings, running headlines, tables of content and indices (all of which are printed herein merely for convenience), the following, except for such portions thereof as may be specifically excluded, shall be deemed to be part of this Contract:

1.1.1 All provisions required by law to be inserted in this Contract, whether actually inserted or not;

1.1.2 The Contract Drawings and Specifications;

1.1.3 The General Conditions and Special Conditions, if any;

1.1.4 The Contract;

1.1.5 The Information for Bidders; Request for Proposals; Notice of Solicitation and Proposal For Bids; Bid or Proposal, and, if used, the Bid Booklet;

1.1.6 The Budget Director's Certificate; all Addenda issued prior to the receipt of the bids; the Notice of Award; Performance and Payment Bonds, if required; and the Notice to Proceed with the Work.

1.2 Should any conflict occur in or between the Drawings and Specifications, the Contractor shall be deemed to have estimated the most expensive way of doing the Work, unless the Contractor shall have asked for and obtained a decision in writing from the Commissioner, of the Agency that is entering into this Contract, before the submission of its bid as to what shall govern.

ARTICLE 2. DEFINITIONS

2.1 The following words and expressions, or pronouns used in their stead, shall, wherever they appear in this Contract, be construed as follows, unless a different meaning is clear from the context:

2.1.1 "Addendum" or "Addenda" shall mean the additional Contract provisions issued in writing by the Commissioner prior to the receipt of bids.

2.1.2 "Agency" shall mean a city, county, borough or other office, position, department, division, bureau, board or commission, or a corporation, institution or agency of government, the expenses of which are paid in whole or in part from the City treasury.

2.1.3 "Agency Chief Contracting Officer" (ACCO) shall mean a person delegated authority by the Commissioner to organize and supervise the procurement activity of subordinate Agency staff in conjunction with the CCPO.

2.1.4 "City" shall mean the City of New York.

2.1.5 "City Chief Procurement Officer" (CCPO) shall mean a person delegated authority by the Mayor to coordinate and oversee the procurement activity of Mayoral agency staff, including the ACCO and any offices which have oversight responsibility for the procurement of construction.

2.1.6 "Commissioner" shall mean the head of the Agency that has entered into this Contract, or his/her duly authorized representative.

2.1.7 "Comptroller" shall mean the Comptroller of the City of New York.

2.1.8 "Contract" or "Contract Documents" shall mean each of the various parts of the contract referred to in Article 1 hereof, both as a whole and severally.

2.1.9 "Contract Drawings" shall mean only those drawings specifically entitled as such and listed in the Specifications or in any Addendum, or any drawings furnished by the Commissioner, pertaining or supplemental thereto.

2.1.10 "Contract Work" shall mean everything required to be furnished and done by the Contractor by any one or more of the parts of the Contract referred to in Article 1, except Extra Work as hereinafter defined.

2.1.11 "Contractor" shall mean the entity which executed this Contract, whether a corporation, firm, partnership, joint venture, individual, or any combination thereof, and it(s), their, his/ her successors, personal representatives, executors, administrators and assigns, and any person, firm, partnership, joint venture, individual, or corporation which shall at any time be substituted in the place of the Contractor under this Contract.

2.1.12 "Days" shall mean calendar days, except where otherwise specified.

2.1.13 "Engineer" or "Architect" or "Project Manager" shall mean the person so designated in writing by the Commissioner to act as such in relation to this Contract, including a private Architect or Engineer or Project Manager, as the case may be.

2.1.14 "Engineering Audit Officer" (EAO) shall mean the person so designated by the Commissioner to perform responsible auditing functions hereunder.

2.1.15 "Extra Work" shall mean Work other than that required by the Contract at the time of award which is authorized by the Commissioner pursuant to Chapter VI of this Contract.

2.1.16 "Federal-Aid Contract" shall mean a contract in which the United States (federal) Government provides financial funding as so designated in the Information for Bidders.

2.1.17 "Final Acceptance" shall mean final written acceptance of all the Work by the Commissioner, a copy of which shall be sent to the Contractor.

2.1.18 "Final Approved Punch List" shall mean a list, approved in writing by the Engineer, specifying those items of Work to be completed by the Contractor after Substantial Completion and dates for the completion of each item of Work.

2.1.19 "Law" or "Laws" shall mean the Constitution of the State of New York, the New York City Charter, the New York City Administrative Code, a Statute of the United States or

of the State of New York, a local law of the City of New York, any ordinance, rule or regulation having the force of law, or common law.

2.1.20 **"Materialman"** shall mean any corporation, firm, partnership, joint venture, or individual, other than employees of the Contractor, who or which contracts with the Contractor or any Subcontractor, to fabricate or deliver, or who actually fabricates or delivers, plant, materials or equipment to be incorporated in the Work.

2.1.21 **"Means and Methods of Construction"** shall mean the labor, materials, temporary structures, tools, plant, and construction equipment, and the manner and time of their use, necessary to accomplish the result intended by this Contract.

2.1.22 **"Other Contractor(s)"** shall mean any Contractor (other than the entity which executed this Contract or its Subcontractors) who has a contract with the City for work on or adjacent to the building or site of the Work.

2.1.23 **"Payroll Taxes"** shall mean State Unemployment Insurance ("SUI"), Federal Unemployment Insurance (FUI) and payments pursuant to the Federal Insurance Contributions Act ("FICA").

2.1.24 **"Project"** shall mean the public improvement to which this Contract relates.

2.1.25 **"Procurement Policy Board" (PPB)** shall mean the Agency of the City of New York whose function is to establish comprehensive and consistent procurement policies and rules which shall have broad application throughout the City.

2.1.26 **"Required Quantity"** in a unit price Contract shall mean the actual quantity of any item of Work or materials which is required to be performed or furnished in order to comply with the Contract.

2.1.27 **"Resident Engineer"** shall mean the representative of the Commissioner duly designated by the Commissioner to be his/her representative at the site of the Work.

2.1.28 **"Site"** shall mean the area upon or in which the Contractor's operations are carried on, and such other areas adjacent thereto as may be designated as such by the Engineer.

2.1.29 **"Specifications"** shall mean all of the directions, requirements and standards of performance applying to the Work as hereinafter detailed and designated under the Specifications.

2.1.30 **"Subcontractor"** shall mean any person, firm or corporation, other than employees of the Contractor, who or which contracts with the Contractor or with its Subcontractors to furnish, or actually furnishes labor, or labor and materials, or labor and equipment, at the site. Wherever the word Subcontractor appears, it shall also mean Sub-Subcontractor.

2.1.31 **"Substantial Completion"** shall mean the written determination by the Commissioner that the Work required under this Contract is substantially, but not entirely, complete.

2.1.32 **"Treasurer"** shall mean the Commissioner of the Department of Finance of the City of New York.

2.1.33 "Work" shall mean all services required to complete the Project in accordance with the Contract Documents, including without limitation, labor, material, superintendence, management, administration, equipment, and incidentals, and shall include both Contract Work and Extra Work.

CHAPTER II THE WORK AND ITS PERFORMANCE

ARTICLE 3. CHARACTER OF THE WORK

3.1 Unless otherwise expressly provided in the **Contract Drawings, Specifications and Addenda**, the **Work** shall be performed in accordance with the best modern practice, utilizing, unless otherwise specified in writing, new and unused materials of standard first grade quality and workmanship and design of the highest quality, to the satisfaction of the **Commissioner**.

ARTICLE 4. MEANS AND METHODS OF CONSTRUCTION

4.1 Unless otherwise expressly provided in the **Contract Drawings, Specifications and Addenda**, the **Means and Methods of Construction** shall be such as the **Contractor** may choose; subject, however, to the **Engineer's** right to reject the **Means and Methods of Construction** proposed by the **Contractor** which in the opinion of the **Engineer**:

- 4.1.1 Will constitute or create a hazard to the **Work**, or to persons or property; or
- 4.1.2 Will not produce finished **Work** in accordance with the terms of the **Contract**; or
- 4.1.3 Will be detrimental to the overall progress of the **Project**.

4.2 The **Engineer's** approval of the **Contractor's Means and Methods of Construction**, or his/her failure to exercise his/her right to reject such means or methods, shall not relieve the **Contractor** of its obligation to complete the **Work** as provided in this **Contract**; nor shall the exercise of such right to reject create a cause of action for damages.

ARTICLE 5. COMPLIANCE WITH LAWS

5.1 The **Contractor** shall comply with all **Laws** applicable to this **Contract** and to the **Work** to be done hereunder.

5.2 **Procurement Policy Board Rules**: This **Contract** is subject to the **Rules of the PPB ("PPB Rules")** in effect at the time of the bid opening for this **Contract**. In the event of a conflict between the **PPB Rules** and a provision of this **Contract**, the **PPB Rules** shall take precedence.

5.3 **Noise control code provisions**.

5.3.1 In accordance with the provisions of Section 24-216(b) of the **Administrative Code of the City ("Administrative Code")**, **Noise Abatement Contract Compliance**, devices and activities which will be operated, conducted, constructed or manufactured pursuant to this **Contract** and which are subject to the provisions of the **City Noise Control Code** shall be operated, conducted, constructed, or manufactured without causing a violation of the **Administrative Code**. Such devices and activities shall incorporate advances in the art of noise control development for the kind and level of noise

emitted or produced by such devices and activities, in accordance with regulations issued by the Commissioner of the Department of Environmental Protection.

5.3.2 The Contractor agrees to comply with Section 24-219 of the Administrative Code of the City ("Administrative Code") and implementing rules codified at 15 Rules of the City of New York ("RCNY") Section 28-100 et. seq. In accordance with such provisions, the Contractor, if the Contractor is the responsible party under such regulations, shall prepare and post a Construction Noise Mitigation Plan at each work site, in which the Contractor shall certify that all construction tools and equipment have been maintained so that they operate at normal manufacturers operating specifications. If the Contractor cannot make this certification, it must have in place an Alternative Noise Mitigation Plan approved by the New York City Department of Environmental Protection. In addition, the Contractor's certified Construction Noise Mitigation Plan is subject inspection by the Department of Environmental Protection in accordance with 15 RCNY §28-101. No Contract work may take place at a worksite unless there is a Construction Noise Mitigation Plan or approved Alternative Noise Mitigation Plan in place. In addition, the Contractor shall create and implement a noise mitigation training program. Failure to comply with these requirements may result in fines and other penalties pursuant to the applicable provisions of the Administrative Code and RCNY.

5.4 Ultra Low Sulfur Diesel Fuel: In accordance with the provisions of Section 24-163.3 of the Administrative Code, the Contractor specifically agrees as follows:

5.4.1 Definitions. For purposes of this Article 5.4, the following definitions apply:

5.4.1(a) "Contractor" means any person or entity that enters into a Public Works Contract with a City agency, or any person or entity that enters into an agreement with such person or entity, to perform work or provide labor or services related to such Public Works Contract

5.4.1(b) "Motor Vehicle" means any self-propelled vehicle designed for transporting persons or property on a street or highway.

5.4.1(c) "Nonroad Engine" means an internal combustion engine (including the fuel system) that is not used in a Motor Vehicle or a vehicle used solely for competition, or that is not subject to standards promulgated under section 7411 or section 7521 of title 42 of the United States Code, except that this term shall apply to internal combustion engines used to power generators, compressors or similar equipment used in any construction program or project.

5.4.1(d) "Nonroad Vehicle" means a vehicle that is powered by a Nonroad Engine, fifty horsepower and greater, and that is not a Motor Vehicle or a vehicle used solely for competition, which shall include, but not be limited to, excavators, backhoes, cranes, compressors, generators, bulldozers and similar equipment, except that this term shall not apply to horticultural maintenance vehicles used for landscaping purposes that are powered by a Nonroad Engine of sixty-five horsepower or less and that are not used in any construction program or project.

5.4.1(e) "Public Works Contract" means a contract with a City agency for a construction program or project involving the construction, demolition, restoration, rehabilitation, repair, renovation, or abatement of any building, structure, tunnel, excavation, roadway, park or bridge; a contract with a City agency for the preparation for any construction program or project involving the construction, demolition, restoration, rehabilitation, repair, renovation, or abatement of any building, structure, tunnel, excavation, roadway, park or bridge; or a contract with a City agency for any final work involved in the completion of any construction program or project involving the construction, demolition, restoration, rehabilitation, repair, renovation, or abatement of any building, structure, tunnel, excavation, roadway, park or bridge.

5.4.1(f) "Ultra Low Sulfur Diesel Fuel" means diesel fuel that has a sulfur content of no more than fifteen parts per million.

5.4.2 Ultra Low Sulfur Diesel Fuel

5.4.2(a) All Contractors shall use Ultra Low Sulfur Diesel Fuel in diesel-powered Nonroad Vehicles in the performance of this Contract.

5.4.2(b) Notwithstanding the requirements of Article 5.4.2(a), Contractors may use diesel fuel that has a sulfur content of no more than thirty parts per million to fulfill the requirements of this Article 5.4.2, where the Commissioner of the New York City Department of Environmental Protection ("DEP Commissioner") has issued a determination that a sufficient quantity of Ultra Low Sulfur Diesel Fuel is not available to meet the needs of City agencies and Contractors. Any such determination shall expire after six months unless renewed.

5.4.2(c) Contractors shall not be required to comply with this Article 5.4.2 where the agency letting this contract makes a written finding, which is approved, in writing, by the DEP Commissioner, that a sufficient quantity of Ultra Low Sulfur Diesel Fuel, or diesel fuel that has a sulfur content of no more than thirty parts per million is not available to meet the requirements of Section 24-163.3 of the Administrative Code, provided that such Contractor in its fulfillment of the requirements of this Contract, to the extent practicable, shall use whatever quantity of Ultra Low Sulfur Diesel Fuel or diesel fuel that has a sulfur content of no more than thirty parts per million is available. Any finding made pursuant to this subdivision shall expire after sixty days, at which time the requirements of this Article 5.4.2 shall be in full force and effect unless the Agency renews the finding in writing and such renewal is approved by the DEP Commissioner.

5.4.2(d) Contractors may check on determinations and approvals issued by the DEP Commissioner pursuant to Section 24-163.3 of the Administrative Code, if any, at www.dep.nyc.gov or by contacting the Agency issuing this solicitation.

5.4.2(e) The requirements of this Article 5.4.2 do not apply where they are precluded by federal or State funding requirements or where the Contract is an emergency procurement.

5.4.3 Best Available Technology

5.4.3(a) All Contractors shall utilize the best available technology for reducing the emission of pollutants for diesel-powered Nonroad Vehicles in the performance of this Contract. For determinations of best available technology for each type of diesel-powered Nonroad Vehicle, Contractors shall comply with the regulations of the City Department of Environmental Protection, as and when adopted, Chapter 14 of Title 15 of the Rules of the City of New York (RCNY). The Contractor shall fully document all steps in the best available technology selection process and shall furnish such documentation to the Agency or the DEP Commissioner upon request. The Contractor shall retain all documentation generated in the best available technology selection process for as long as the selected best available technology is in use.

5.4.3(b) No Contractor shall be required to replace best available technology for reducing the emission of pollutants or other authorized technology utilized for a diesel-powered Nonroad Vehicle in accordance with the provisions of this Article 5.4.3 within three years of having first utilized such technology for such vehicle.

5.4.3(c) This Article 5.4.3 shall not apply to any vehicle used to satisfy the requirements of a specific Public Works Contract for fewer than twenty calendar days.

5.4.3(d) The Contractor shall not be required to comply with this Article 5.4.3 with respect to a diesel-powered Nonroad Vehicle under the following circumstances:

5.4.3(d)(1) Where the agency makes a written finding, which is approved, in writing, by the DEP Commissioner, that the best available technology for reducing the emission of pollutants as required by those paragraphs is unavailable for such vehicle, Contractor shall use whatever technology for reducing the emission of pollutants, if any, is available and appropriate for such vehicle.

5.4.3(d)(2) Where the DEP Commissioner has issued a written waiver based upon the Contractor having demonstrated to the DEP Commissioner that the use of the best available technology for reducing the emission of pollutants might endanger the operator of such vehicle or those working near such vehicle, due to engine malfunction, Contractor shall use whatever technology for reducing the emission of pollutants, if any, is available and appropriate for such vehicle, which would not endanger the operator of such vehicle or those working near such vehicle.

5.4.3(d)(3) In determining which technology to use for the purposes of Articles 5.4.3(d)(1) and 5.4.3(d)(2) above, Contractor shall primarily consider the reduction in emissions of particulate matter and secondarily consider the reduction in emissions of nitrogen oxides associated with the use of such technology, which shall in no event result in an increase in the emissions of either such pollutant.

5.4.3(d)(4) Contractors shall submit requests for a finding or a waiver pursuant to this Article 5.4.3(d) in writing to the DEP Commissioner, with a copy to the ACCO of the Agency issuing the solicitation. Any finding or waiver made or issued pursuant to Articles 5.4.3(d)(1) and 5.4.3(d)(2) above shall expire after one hundred eighty days, at which time the requirements of Article 5.4.3(a) shall be in full force and effect unless the Agency renews the finding, in writing, and the DEP Commissioner approves such finding, in writing, or the DEP Commissioner renews the waiver, in writing.

5.4.3(e) The requirements of this Article 5.4.3 do not apply where they are precluded by federal or State funding requirements or where the contract is an emergency procurement.

5.4.4 Section 24-163 of the Administrative Code. Contractors shall comply with Section 24-163 of the Administrative Code related to the idling of the engines of motor vehicles while parking.

5.4.5 Compliance

5.4.5(a) Contractor's compliance with Article 5.4 may be independently monitored. If it is determined that the Contractor has failed to comply with any provision of Article 5.4, any costs associated with any independent monitoring incurred by the City shall be reimbursed by the Contractor.

5.4.5(b) Any Contractor who violates any provision of Article 5.4, except as provided in Article 5.4.5(c) below, shall be liable for a civil penalty between the amounts of one thousand and ten thousand dollars, in addition to twice the amount of money saved by such Contractor for failure to comply with Article 5.4.

5.4.5(c) No Contractor shall make a false claim with respect to the provisions of Article 5.4 to a City agency. Where a Contractor has been found to have done so, such Contractor shall be liable for a civil penalty of twenty thousand dollars, in addition to twice the amount of money saved by such Contractor in association with having made such false claim.

5.4.6 Reporting

5.4.6(a) For all Public Works Contracts covered by this Article 5.4, the Contractor shall report to the Department the following information:

5.4.6(1) The total number of diesel-powered Nonroad Vehicles used to fulfill the requirements of this Public Works Contract;

5.4.6(2) The number of such Nonroad Vehicles that were powered by Ultra Low Sulfur Diesel Fuel;

5.4.6(3) The number of such Nonroad Vehicles that utilized the best available technology for reducing the emission of pollutants, including a breakdown by vehicle model and the type of technology;

5.4.6(4) The number of such Nonroad Vehicles that utilized such other authorized technology in accordance with Article 5.4.3, including a breakdown by vehicle model and the type of technology used for each such vehicle;

5.4.6(5) The locations where such Nonroad Vehicles were used; and

5.4.6(6) Where a determination is in effect pursuant to Article 5.4.2(b) or 5.4.2(c), detailed information concerning the Contractor's efforts to obtain Ultra Low Sulfur Diesel Fuel or diesel fuel that has a sulfur content of no more than thirty parts per million.

5.4.6(b) The Contractor shall submit the information required by Article 5.4.6(a) at the completion of work under the Public Works Contract and on a yearly basis no later than August 1 throughout the term of the Public Works Contract. The yearly report shall cover work performed the preceding fiscal year (July 1 - June 30).

5.5 Ultra Low Sulfur Diesel Fuel. In accordance with the Coordinated Construction Act for Lower Manhattan, as amended:

5.5.1 Definitions. For purposes of this Article 5.5, the following definitions apply:

5.5.1(a) "Lower Manhattan" means the area to the south of and within the following lines: a line beginning at a point where the United States pierhead line in the Hudson river as it exists now or may be extended would intersect with the southerly line of West Houston street in the borough of Manhattan extended, thence easterly along the southerly side of West Houston street to the southerly side of Houston street, thence easterly along the southerly side of Houston street to the southerly side of East Houston street, thence northeasterly along the southerly side of East Houston street to the point where it would intersect with the United States pierhead line in the East river as it exists now or may be extended, including tax lots within or immediately adjacent thereto.

5.5.1(b) "Lower Manhattan Redevelopment Project" means any project in Lower Manhattan that is funded in whole or in part with federal or State funding, or any project intended to improve transportation between Lower Manhattan and the two air terminals in the City of New York known as LaGuardia Airport and John F. Kennedy International Airport, or between Lower Manhattan and the air terminal in Newark known as Newark Liberty International Airport, and that is funded in whole or in part with federal funding.

5.5.1(c) "Nonroad Engine" means an internal combustion engine (including the fuel system) that is not used in a Motor Vehicle or a vehicle used solely for competition, or that is not subject to standards promulgated under section 7411 or section 7521 of title 42 of the United States Code, except that this term shall apply to internal combustion engines used to power generators, compressors or similar equipment used in any construction program or project.

5.5.1(d) "Nonroad Vehicle" means a vehicle that is powered by a Nonroad Engine, fifty horsepower and greater, and that is not a Motor Vehicle or a vehicle used solely for competition, which shall include, but not be limited to, excavators, backhoes, cranes, compressors, generators, bulldozers and similar equipment, except that this terms shall not apply to horticultural maintenance vehicles used for landscaping purposes that are powered by a Nonroad Engine of sixty-five horsepower or less and that are not used in any construction program or project.

5.5.1(e) "Ultra Low Sulfur Diesel Fuel" means diesel fuel that has a sulfur content of no more than fifteen parts per million.

5.5.2 Requirements. Contractors and Subcontractors are required to use only Ultra Low Sulfur Diesel Fuel to power the diesel-powered Nonroad Vehicles with engine horsepower (HP) rating of 50 HP and above used on a Lower Manhattan Redevelopment Project and, where practicable, to reduce the emission of pollutants by retrofitting such Nonroad Vehicles with oxidation catalysts, particulate filters, or technology that achieves lowest particulate matter emissions.

5.6 Pesticides. In accordance with Section 17-1209 of the Administrative Code, to the extent that the Contractor or any Subcontractor applies pesticides to any property owned or leased by the City, the Contractor and any Subcontractor shall comply with chapter 12 of the Administrative Code.

ARTICLE 6. INSPECTION

6.1 During the progress of the Work and up to the date of Final Acceptance, the Contractor shall at all times afford the representatives of the City every reasonable, safe and proper facility for inspecting all Work done or being done at the Site and also for inspecting the manufacture or preparation of materials and equipment at the place of such manufacture or preparation.

6.2 The Contractor's obligation hereunder shall include the uncovering or taking down of finished Work and its restoration thereafter; provided, however, that the order to uncover, take down and restore shall be in writing, and further provided that if Work thus exposed proves satisfactory, and if the Contractor has complied with Article 6.1, such uncovering or taking down and restoration shall be considered an item of Extra Work to be paid for in accordance with the provisions of Article 26. If the Work thus exposed proves unsatisfactory, the City has no obligation to compensate the Contractor for the uncovering, taking down or restoration.

6.3 Inspection and approval by the Commissioner, the Engineer, Project Manager, or Resident Engineer, of finished Work or of Work being performed, or of materials and equipment at the place of manufacture or preparation, shall not relieve the Contractor of its obligation to perform the Work in strict accordance with the Contract. Finished or unfinished Work not found to be in strict accordance with the Contract shall be replaced as directed by the Engineer, even though such Work may have been previously approved and paid for. Such corrective work is Contract Work and shall not be deemed Extra Work.

6.4 Rejected Work and materials shall be promptly taken down and removed from the Site, which must at all times be kept in a reasonably clean and neat condition.

**ARTICLE 7. PROTECTION OF WORK AND OF PERSONS
AND PROPERTY; NOTICES AND INDEMNIFICATION**

7.1 During the performance of the Work and up to the date of Final Acceptance, the Contractor shall be under an absolute obligation to protect the finished and unfinished Work against any damage, loss, injury, theft and/or vandalism and in the event of such damage, loss, injury, theft and/or vandalism, it shall promptly replace and/or repair such Work at the Contractor's sole cost and expense, as directed by the Resident Engineer. The obligation to deliver finished Work in strict accordance with the Contract prior to Final Acceptance shall be absolute and shall not be affected by the Resident Engineer's approval of, or failure to prohibit, the Means and Methods of Construction used by the Contractor.

7.2 During the performance of the Work and up to the date of Final Acceptance, the Contractor shall take all reasonable precautions to protect the persons and property of the City and of others from damage, loss or injury resulting from the Contractor's, and/or its Subcontractors' operations under this Contract. The Contractor's obligation to protect shall include the duty to provide, place or replace and adequately maintain at or about the Site suitable and sufficient protection such as lights, barricades, and enclosures.

7.3 The Contractor shall comply with the notification requirements set forth below in the event of any loss, damage or injury to Work, persons or property, or any accidents arising out of the operations of the Contractor and/or its Subcontractors under this Contract.

7.3.1 The Contractor shall make a full and complete report in writing to the Resident Engineer within three (3) Days after the occurrence.

7.3.2 The Contractor shall notify in writing the commercial general liability insurance carrier, and, where applicable, the worker's compensation and/or other insurance carrier, of any such loss, damage, injury, or accident, and any claim or suit arising therefrom, immediately, but not later than 20 days after such event. The Contractor's notice to the commercial general liability insurance carrier must expressly specify that "this notice is being given on behalf of the City of New York as Additional Insured as well as [the Contractor] as Named Insured." The Contractor's notice to the insurance carrier shall contain the following information: the name of the Contractor, the number of the Contract, the date of the occurrence, the location (street address and borough) of the occurrence, and the identity of the persons or things injured, damaged or lost.

7.3.2(a) At the time notice is provided to the insurance carrier(s), the Contractor shall provide copies of such notice to the Comptroller and the Commissioner. Notice to the Comptroller shall be sent to the Insurance Unit, NYC Comptroller's Office, 1 Centre Street - Room 1222, New York, New York, 10007. Notice to the Commissioner shall be sent to the address set forth in Schedule A of the General Conditions.

7.3.2(b) If the Contractor fails to provide any of the foregoing notices to any appropriate insurance carrier(s) in a timely and complete manner, the Contractor shall indemnify the City for all losses, judgments, settlements and expenses, including reasonable attorneys' fees, arising from an insurer's disclaimer of coverage citing late notice by or on behalf of the City.

7.4 To the fullest extent permitted by law, the Contractor shall indemnify, defend and hold the City, its employees and agents (the "Indemnitees") harmless against any and all claims (including but not limited to claims asserted by any employee of the Contractor and/or its Subcontractors) and costs and expenses of whatever kind (including but not limited to payment or reimbursement of attorneys' fees and disbursements) allegedly arising out of or in any way related to the operations of the Contractor and/or its Subcontractors in the performance of this Contract or from the Contractor's and/or its Subcontractors' failure to comply with any of the provisions of this Contract or of the Law. Such costs and expenses shall include all those incurred in defending the underlying claim and those incurred in connection with the enforcement of this Article 7.4 by way of cross-claim, third-party

claim, declaratory action or otherwise. The parties expressly agree that the indemnification obligation hereunder contemplates (1) full indemnity in the event of liability imposed against the Indemnitees without negligence and solely by reason of statute, operation of law or otherwise; and (2) partial indemnity in the event of any actual negligence on the part of the Indemnitees either causing or contributing to the underlying claim (in which case, indemnification will be limited to any liability imposed over and above that percentage attributable to actual fault whether by statute, by operation of law, or otherwise). Where partial indemnity is provided hereunder, all costs and expenses shall be indemnified on a pro rata basis.

7.4.1 Indemnification under Article 7.4 or any other provision of the **Contract** shall operate whether or not **Contractor** or its **Subcontractors** have placed and maintained the insurance specified under Article 22.

7.5 The **Contractor** waives all rights against the **City** for any damages or losses for which either is covered under any insurance required under Article 22 (whether or not such insurance is actually procured) or any other insurance applicable to the operations of the **Contractor** and/or its **Subcontractors** in the performance of this **Contract**.

7.6 The provisions of this Article shall not be deemed to create any new right of action in favor of third parties against the **Contractor** or the **City**.

CHAPTER III TIME PROVISIONS

ARTICLE 8. COMMENCEMENT AND PROSECUTION OF THE WORK

8.1 The **Contractor** shall commence **Work** on the date specified in a written notice signed by the **Commissioner**. The time for performance of the **Work** under the **Contract** shall be computed from the date specified in such written notice. **TIME BEING OF THE ESSENCE** to the **City**, the **Contractor** shall thereafter prosecute the **Work** diligently, using such **Means and Methods of Construction** as are in accord with Article 4 herein and as will assure its completion not later than the date specified herein, or on the date to which the time for completion may be extended.

ARTICLE 9. PROGRESS SCHEDULES

9.1 To enable the **Work** to be performed in an orderly and expeditious manner, the **Contractor**, within fifteen (15) **Days** after the **Notice to Proceed** with this **Contract**, unless otherwise directed by the **Engineer**, shall submit to the **Engineer** a proposed progress schedule in the form of a bar graph or in such other form as specified by the **Engineer**, and monthly cash flow requirements, showing:

9.1.1 The anticipated time of commencement and completion of each of the various operations to be performed under this **Contract**; and

9.1.2 The sequence and interrelation of each of these operations with the others and with those of other related **Contracts**; and

9.1.3 The estimated time required for fabrication or delivery, or both, of all materials and equipment required for the **Work**; and

9.1.4 The estimated amount in dollars the **Contractor** will claim on a monthly basis.

9.2 The proposed schedule shall be revised as directed by the **Engineer**, until finally approved by the **Engineer**, and after such approval, subject to the provisions of Article 11, shall be strictly adhered to by the **Contractor**.

9.3 If the **Contractor** shall fail to adhere to the approved progress schedule, or to the schedule as revised pursuant to Article 11, it shall promptly adopt such other or additional **Means and Methods of Construction** as will make up for the time lost and will assure completion in accordance with the approved progress schedule. The approval by the City of a progress schedule which is shorter than the time allotted under the **Contract** shall not create any liability for the City if the approved progress schedule is not met.

9.4 The **Contractor** will not receive any payments until the proposed progress schedule is submitted.

ARTICLE 10. REQUESTS FOR INFORMATION OR APPROVAL

10.1 From time to time as the **Work** progresses and in the sequence indicated by the approved progress schedule, the **Contractor** shall submit to the **Engineer** a specific request in writing for each item of information or approval required by the **Contractor**. These requests shall state the latest date upon which the information or approval is actually required by the **Contractor**, and shall be submitted in a reasonable time in advance thereof to enable the **Engineer** a sufficient time to act upon such submissions, or any necessary re-submissions thereof.

10.2 The **Contractor** shall not have any right to an extension of time on account of delays due to the **Contractor's** failure to submit requests for the required information or the required approval in accordance with the above requirements.

ARTICLE 11. NOTICE OF CONDITIONS CAUSING DELAY AND DOCUMENTATION OF DAMAGES CAUSED BY DELAY

11.1 After the commencement of any condition which is causing or may cause a delay in completion of the **Work**, including conditions for which the **Contractor** may be entitled to an extension of time, the following notifications and submittals are required:

11.1.1 Within seven (7) **Days** after the commencement of such condition, the **Contractor** must notify the **Engineer** in writing of the existence, nature and effect of such condition upon the approved progress schedule and the **Work**, and must state why and in what respects, if any, the condition is causing or may cause a delay.

11.1.2 If the **Contractor** shall claim to be sustaining damages for delay, by reason of any act or omission of the City or its agents, it shall submit to the **Commissioner** within forty-five (45) **Days** from the time such damages are first incurred, and every thirty (30) **Days** thereafter for as long as such damages are incurred, verified statements of the details and the amounts of such damages, together with documentary evidence of such damages. The **Contractor** may submit any of the above statements within such additional time as may be granted by the **Commissioner** in writing upon written request therefor. Failure of the **Commissioner** to respond in writing to a written request for additional time within thirty (30) **Days** shall be deemed a denial of the request. On failure of the **Contractor** to fully comply with the foregoing provisions, such claims shall be deemed waived and no right to recover on such claims shall exist. Damages that the **Contractor** may claim in any action arising under or by reason of this **Contract** shall not be different from or in excess of the statements made and documentation provided pursuant to this article.

11.2 Failure of the Contractor to strictly comply with the requirements of Article 11.1.1 may, in the discretion of the Commissioner, be deemed sufficient cause to deny any extension of time on account of delay arising out of such condition. Failure of the Contractor to strictly comply with the requirements of Articles 11.1.1 and 11.1.2 shall be deemed a conclusive waiver by the Contractor of any and all claims for damages for delay arising from such condition and no right to recover on such claims shall exist.

11.3 When appropriate and directed by the Engineer, the progress schedule shall be revised by the Contractor until finally approved by the Engineer. The revised progress schedule must be strictly adhered to by the Contractor.

ARTICLE 12. COORDINATION WITH OTHER CONTRACTORS

12.1 During the progress of the Work, Other Contractors may be engaged in performing other work or may be awarded other contracts for additional work on this Project. In that event, the Contractor shall coordinate the Work to be done hereunder with the work of such Other Contractors and the Contractor shall fully cooperate with such Other Contractors and carefully fit its own Work to that provided under other contracts as may be directed by the Engineer. The Contractor shall not commit or permit any act which will interfere with the performance of work by any Other Contractors.

12.2 If the Engineer shall determine that the Contractor is failing to coordinate its Work with the work of Other Contractors as the Engineer has directed, then the Commissioner shall have the right to withhold any payments otherwise due hereunder until the Contractor completely complies with the Engineer's directions.

12.3 The Contractor shall notify the Engineer in writing if any Other Contractor on this Project is failing to coordinate its work with the Work of this Contract. If the Engineer finds such charges to be true, the Engineer shall promptly issue such directions to the Other Contractor with respect thereto as the situation may require. The City shall not, however, be liable for any damages suffered by any Other Contractor's failure to coordinate its work with the Work of this Contract or by reason of the Other Contractor's failure to promptly comply with the directions so issued by the Engineer, or by reason of any Other Contractor's default in performance, it being understood that the City does not guarantee the responsibility or continued efficiency of any contractor. The Contractor agrees to make no claim against the City for any damages relating to or arising out of any directions issued by the Engineer pursuant to this article (including but not limited to the failure of any Other Contractor to comply or promptly comply with such directions), or the failure of the Engineer to issue any directions, or the failure of any Other Contractor to coordinate its work, or the default in performance of any Other Contractor.

12.4 The Contractor shall indemnify and hold the City harmless from any and all claims or judgments for damages and from costs and expenses to which the City may be subjected or which it may suffer or incur by reason of the Contractor's failure to comply with the Engineer's directions promptly; and the Comptroller shall have the right to exercise the powers reserved in Article 23 with respect to any claims which may be made for damages due to this Contractor's failure to comply with the Engineer's direction promptly. Insofar as the facts and Law relating to any claim would preclude the City from being completely indemnified by the Contractor, the City shall be partially indemnified by the Contractor to the fullest extent provided by Law.

12.5 Should the Contractor sustain any damage through any act or omission of any Other Contractor having a contract with the City for the performance of work upon the Site or of work which may be necessary to be performed for the proper prosecution of the Work to be performed hereunder, or through any act or omission of a Subcontractor of such Contractor, the Contractor shall have no claim against the City for such damage, but shall have a right to recover such damage from the Other Contractor under the provision similar to the following provisions which apply to this Contract and have been or will be inserted in the contracts with such Other Contractors:

12.5.1 Should any **Other Contractor** having or who shall hereafter have a contract with the **City** for the performance of work upon the **Site** sustain any damage through any act or omission of the **Contractor** hereunder or through any act or omission of any **Subcontractor** of the **Contractor**, the **Contractor** agrees to reimburse such **Other Contractor** for all such damages and to defend at its own expense any suit based upon such claim and if any judgment or claims (even if the allegations of the suit are without merit) against the **City** shall be allowed the **Contractor** shall pay or satisfy such judgment or claim and pay all costs and expenses in connection therewith and agrees to indemnify and hold the **City** harmless from all such claims. Insofar as the facts and **Law** relating to any claim would preclude the **City** from being completely indemnified by the **Contractor**, the **City** shall be partially indemnified by the **Contractor** to the fullest extent provided by **Law**.

12.6 The **City's** right to indemnification hereunder shall in no way be diminished, waived or discharged, by its recourse to assessment of liquidated damages as provided in Article 15, or by the exercise of any other remedy provided for by **Contract** or by **Law**.

ARTICLE 13. EXTENSION OF TIME FOR PERFORMANCE

13.1 If performance by the **Contractor** is delayed for a reason set forth in Article 13.3, the **Contractor** may be allowed a reasonable extension of time in conformance with this article and the **PPB Rules**.

13.2 Any extension of time may be granted only by the **Commissioner** or by the **Board** for the Extension of Time (hereafter "**Board**") (as set forth below) upon written application by the **Contractor**.

13.3 Grounds for Extension: If such application is made, the **Contractor** shall be entitled to an extension of time for delay in completion of the **Work** caused solely:

13.3.1 By the acts or omissions of the **City**, its officers, agents or employees; or

13.3.2 By the act or omissions of **Other Contractors** on this **Project**; or

13.3.3 By supervening conditions entirely beyond the control of either party hereto (such as, but not limited to, acts of God or the public enemy, excessive inclement weather, war or other national emergency making performance temporarily impossible or illegal, or strikes or labor disputes not brought about by any act or omission of the **Contractor**).

13.3.4 The **Contractor** shall, however, be entitled to an extension of time for such causes only for the number of **Days** of delay which the **Commissioner** or the **Board** may determine to be due solely to such causes, and then only if the **Contractor** shall have strictly complied with all of the requirements of Articles 9 and 10.

13.4 The **Contractor** shall not be entitled to receive a separate extension of time for each of several causes of delay operating concurrently, but, if at all, only for the actual period of delay in completion of the **Work** as determined by the **Commissioner** or the **Board**, irrespective of the number of causes contributing to produce such delay. If one of several causes of delay operating concurrently results from any act, fault or omission of the **Contractor** or of its **Subcontractors** or **Materialmen**, and would of itself (irrespective of the concurrent causes) have delayed the **Work**, no extension of time will be allowed for the period of delay resulting from such act, fault or omission.

13.5 The determination made by the **Commissioner** or the **Board** on an application for an extension of time shall be binding and conclusive on the **Contractor**.

13.6 The granting of an application for an extension of time for causes of delay other than those herein referred to shall be entirely within the discretion of the **Commissioner** or the **Board**.

13.7 Permitting the **Contractor** to continue with the **Work** after the time fixed for its completion has expired, or after the time to which such completion may have been extended has expired, or the making of any payment to the **Contractor** after such time, shall in no way operate as a waiver on the part of the **City** of any of its rights under this **Contract**.

13.8 Application for Extension of Time:

13.8.1 Before the **Contractor's** time extension request will be considered, the **Contractor** shall notify the **Commissioner** of the condition which allegedly has caused or is causing the delay, and shall submit a written application to the **Commissioner** identifying:

13.8.1(a) The **Contractor**; the registration number; and **Project** description;

13.8.1(b) Liquidated damage assessment rate, as specified in the **Contract**;

13.8.1(c) Original bid amount;

13.8.1(d) The original **Contract** start date and completion date;

13.8.1(e) Any previous time extensions granted (number and duration); and

13.8.1(f) The extension of time requested.

13.8.2 In addition, the application for extension of time shall set forth in detail:

13.8.2(a) The nature of each alleged cause of delay in completing the **Work**;

13.8.2(b) The date upon which each such cause of delay began and ended and the number of **Days** attributable to each such cause;

13.8.2(c) A statement that the **Contractor** waives all claims except for those delineated in the application, and the particulars of any claims which the **Contractor** does not agree to waive. For time extensions for **Substantial Completion** and final completion payments, the application shall include a detailed statement of the dollar amounts of each element of claim item reserved; and

13.8.2(d) A statement indicating the **Contractor's** understanding that the time extension is granted only for purposes of permitting continuation of **Contract** performance and payment for **Work** performed and that the **City** retains its right to conduct an investigation and assess liquidated damages as appropriate in the future.

13.9 Analysis and Approval of Time Extensions:

13.9.1 For time extensions for partial payments, a written determination shall be made by the **Commissioner** who may, for good and sufficient cause, extend the time for the performance of the **Contract** as follows:

13.9.1(a) If the **Work** is to be completed within six (6) months, the time for performance may be extended for sixty (60) **Days**;

13.9.1(b) If the **Work** is to be completed within less than one (1) year but more than six (6) months, an extension of ninety (90) **Days** may be granted;

13.9.1(c) If the **Contract** period exceeds one (1) year, besides the extension granted in Article 13.9.1(b), an additional thirty (30) **Days** may be granted for each multiple of six (6) months involved beyond the one (1) year period; or

13.9.1(d) If exceptional circumstances exist, the **Commissioner** may extend the time for performance beyond the extensions in Articles 13.9.1(a), 13.9.1(b), and 13.9.1(c). In that event, the **Commissioner** shall file with the Mayor's Office of Contract Services a written explanation of the exceptional circumstances.

13.9.2 For extensions of time for **Substantial Completion** and final completion payments, the **Engineer**, in consultation with the **Commissioner**, shall prepare a written analysis of the delay (including a preliminary determination of the causes of delay, the beginning and end dates for each such cause of delay, and whether the delays are excusable under the terms of this **Contract**). The report shall be subject to review by and approval of the Board, which shall have authority to question its analysis and determinations and request additional facts or documentation. The report as reviewed and made final by the Board shall be made a part of the **Agency Contract** file. Neither the report itself nor anything contained therein shall operate as a waiver or release of any claim the City may have against the **Contractor** for either actual or liquidated damages.

13.9.3 Approval Mechanism for Time Extensions for **Substantial Completion** or Final Completion Payments: An extension shall be granted only with the approval of the Board which is comprised of the **ACCO** of the **Agency**, the Corporation Counsel and the **Comptroller**, or their authorized representatives.

13.9.4 Neither the granting of any application for an extension of time to the **Contractor** or any other **Contractor** on this **Project** nor the papers, records or reports related to any application for or grant of an extension of time or determination related thereto shall be referred to or offered in evidence by the **Contractor** or its attorneys in any action or proceeding.

13.10 No Damage for Delay: The **Contractor** agrees to make no claim for damages for delay in the performance of this **Contract** occasioned by any act or omission to act of the City or any of its representatives, and agrees that all it may be entitled to on account of any such delay is an extension of time to complete performance of the **Work** as provided herein.

ARTICLE 14. COMPLETION AND FINAL ACCEPTANCE OF THE WORK

14.1 **Date for Substantial Completion:** The **Contractor** shall substantially complete the **Work** within the time fixed in Schedule A of the General Conditions, or within the time to which such **Substantial Completion** may be extended.

14.2 **Determining the Date of Substantial Completion:** The **Work** will be deemed to be substantially complete when the two conditions set forth in Articles 14.2.1 and 14.2.2 have been met. The **Commissioner** will then issue a **Certificate of Substantial Completion**.

14.2.1 **Inspection:** The **Engineer** has inspected the **Work** and has made a written determination that it is substantially complete.

14.2.2 Approval of Final Punch List and Date for Final Acceptance: Following inspection of the Work, the Engineer shall furnish the Contractor a final punch list, specifying all items of Work to be completed. The Contractor shall then submit to the Engineer dates for the completion of each specified item of Work. Within a reasonable time after receipt, the Engineer, in a written notification to the Contractor, shall approve the Contractor's completion dates or, if they are unable to agree, shall establish dates for the completion of each item of Work. The latest completion date specified shall be the date for Final Acceptance of the Work.

14.3 Determining the Date of Final Acceptance: The Work will be accepted as final and complete as of the date of the Engineer's inspection if, upon such inspection, the Engineer finds that all items on the Final Approved Punch List are complete and no further Work remains to be done. The Commissioner will then issue a written determination of Final Acceptance.

14.4 Request for Inspection: Inspection of the Work by the Engineer for the purpose of Substantial Completion or Final Acceptance shall be made within ten (10) Days after receipt of the Contractor's written request therefor.

14.5 Request for Re-inspection: If upon inspection for the purpose of Substantial Completion or Final Acceptance, the Engineer determines that there are items of Work still to be performed, the Contractor shall promptly perform them and then request a re-inspection. If upon re-inspection, the Engineer determines that the Work is substantially complete or finally accepted, the date of such re-inspection shall be the date of Substantial Completion or Final Acceptance. Re-inspection by the Engineer shall be made within ten (10) Days after receipt of the Contractor's written request therefor.

14.6 Initiation of Inspection by the Engineer: If the Contractor does not request inspection or re-inspection of the Work for the purpose of Substantial Completion or Final Acceptance, the Engineer may initiate such inspection or re-inspection.

ARTICLE 15. LIQUIDATED DAMAGES

15.1 In the event the Contractor fails to complete the Work within the time fixed for such completion in Schedule A of the General Conditions, plus authorized time extensions, or if the Contractor, in the sole determination of the Commissioner, has abandoned the Work, the Contractor shall pay to the City the sum fixed in Schedule A of the General Conditions, for each and every Day that the time consumed in completing the Work exceeds the time allowed therefor; which said sum, in view of the difficulty of accurately ascertaining the loss which the City will suffer by reason of delay in the completion of the Work hereunder, is hereby fixed and agreed as the liquidated damages that the City will suffer by reason of such delay, and not as a penalty. This article shall apply to the Contractor if it is defaulted pursuant to Chapter X of this Contract. Neither the failure to assess liquidated damages nor the granting of any time extension shall operate as a waiver or release of any claim the City may have against the Contractor for either actual or liquidated damages.

15.2 Liquidated damages received hereunder are not intended to be nor shall they be treated as either a partial or full waiver or discharge of the City's right to indemnification, or the Contractor's obligation to indemnify the City, or to any other remedy provided for in this Contract or by Law.

15.3 The Commissioner may deduct and retain out of the monies which may become due hereunder, the amount of any such liquidated damages; and in case the amount which may become due hereunder shall be less than the amount of liquidated damages suffered by the City, the Contractor shall be liable to pay the difference.

ARTICLE 16. OCCUPATION OR USE PRIOR TO COMPLETION

16.1 Unless otherwise provided for in the specifications, the **Commissioner** may take over, use, occupy or operate any part of the **Work** at any time prior to **Final Acceptance**, upon written notification to the **Contractor**. The **Engineer** shall inspect the part of the **Work** to be taken over, used, occupied, or operated, and will furnish the **Contractor** with a written statement of the **Work**, if any, which remains to be performed on such part. The **Contractor** shall not object to, nor interfere with, the **Commissioner's** decision to exercise the rights granted by this article. In the event the **Commissioner** takes over, uses, occupies, or operates any part of the **Work**:

16.1.1 the **Commissioner** shall issue a written determination of **Substantial Completion** with respect to such part of the **Work**;

16.1.2 the **Contractor** shall be relieved of its absolute obligation to protect such part of the unfinished **Work** in accordance with Article 7;

16.1.3 the **Contractor's** guarantee on such part of the **Work** shall begin on the date of such use by the **City**; and;

16.1.4 the **Contractor** shall be entitled to a return of so much of the amount retained in accordance with Article 21 as it relates to such part of the **Work**, except so much thereof as may be retained under Articles 24 and 44.

CHAPTER IV SUBCONTRACTS AND ASSIGNMENTS

ARTICLE 17. SUBCONTRACTS

17.1 The **Contractor** shall not make subcontracts totaling an amount more than the percentage of the total **Contract** price fixed in Schedule A of the **General Conditions**, without prior written permission from the **Commissioner**. All subcontracts made by the **Contractor** shall be in writing. No work may be performed by a **Subcontractor** prior to the **Contractor** entering into a written subcontract with the **Subcontractor** and complying with the provisions of this Article 17.

17.2 Before making any subcontracts, the **Contractor** shall submit a written statement to the **Commissioner** giving the name and address of the proposed **Subcontractor**, the portion of the **Work** and materials which it is to perform and furnish, the cost of the subcontract, the **VENDEX** questionnaire if required, and any other information tending to prove that the proposed **Subcontractor** has the necessary facilities, skill, integrity, past experience and financial resources to perform the **Work** in accordance with the terms and conditions of this **Contract**.

17.3 If an approved **Subcontractor** elects to subcontract any portion of its subcontract, the proposed sub-subcontract shall be submitted in the same manner as directed above.

17.4 The **Commissioner** will notify the **Contractor** in writing whether the proposed **Subcontractor** is qualified or not qualified. If the proposed **Subcontractor** is not qualified, the **Contractor** may submit another proposed **Subcontractor** unless the **Contractor** decides to do the **Work**. No **Subcontractor** shall be permitted on the **Site** unless approved.

17.5 Before entering into any subcontract hereunder, the **Contractor** shall inform the **Subcontractor** fully and completely of all provisions and requirements of this **Contract** relating either directly or indirectly to the **Work** to be performed and the materials to be furnished under such subcontract, and every such **Subcontractor** shall

expressly stipulate that all labor performed and materials furnished by the Subcontractor shall strictly comply with the requirements of this Contract.

17.6 Documents given to a Subcontractor for the purpose of soliciting the Subcontractor's bid shall include either a copy of the bid cover or a separate information sheet setting forth the Project name, the Contract number (if available), the Agency (as noted in Article 2.1.6), and the Project's location.

17.7 The Commissioner's approval of a Subcontractor shall not relieve the Contractor of any of its responsibilities, duties and liabilities hereunder. The Contractor shall be solely responsible to the City for the acts or defaults of its Subcontractor and of such Subcontractor's officers, agents and employees, each of whom shall, for this purpose, be deemed to be the agent or employee of the Contractor to the extent of its subcontract.

17.8 The Contractor shall be responsible for ensuring that all Subcontractors performing Work at the Site have either their own insurance coverage or are covered by the Contractor's insurance as required by Article 22.

17.9 The Contractor shall promptly, upon request, file with the Engineer a conformed copy of the subcontract and its cost. The subcontract shall provide the following:

17.9.1 Payment to Subcontractors: The agreement between the Contractor and its Subcontractors shall contain the same terms and conditions as to method of payment for Work, labor and materials, and as to retained percentages, as are contained in this Contract.

17.9.2 Prevailing Rate of Wages: The agreement between the Contractor and its Subcontractors shall include the prevailing wage rates and supplemental benefits to be paid in accordance with Labor Law Section 220.

17.9.3 Section 6-123 of the Administrative Code: Pursuant to the requirements of Section 6-123 of the Administrative Code, every agreement between the Contractor and its Subcontractors in excess of \$50,000 shall include a provision that the Subcontractor shall not engage in any unlawful discriminatory practice as defined in Title VIII of the Administrative Code (Section 8-101 et. seq.).

17.10 The Commissioner may deduct from the amounts certified under this Contract to be due to the Contractor, the sum or sums due and owing from the Contractor to the Subcontractors according to the terms of the said subcontracts, and in case of dispute between the Contractor and its Subcontractor, or Subcontractors, as to the amount due and owing, the Commissioner may deduct and withhold from the amounts certified under this Contract to be due to the Contractor such sum or sums as may be claimed by such Subcontractor, or Subcontractors, in a sworn affidavit, to be due and owing until such time as such claim or claims shall have been finally adjusted.

17.11 On Contracts where 100% performance bonds and payment bonds are executed, the Contractor shall include on each requisition for payment the following data: Subcontractor's name, value of the subcontract, total amount previously paid to Subcontractor for Work previously requisitioned, and the amount, including retainage, to be paid to the Subcontractor for Work included in the requisition.

17.12 On Contracts where performance bonds and payment bonds are not executed, the Contractor shall include with each requisition for payment submitted hereunder, a signed statement from each and every Subcontractor and/or Materialman for whom payment is requested in such requisition. Such signed statement shall be on the letterhead of the Subcontractor and/or Materialman for whom payment is requested and shall (i) verify that such Subcontractor and/or Materialman has been paid in full for all work performed and/or material supplied to date, exclusive of any amount retained and any amount included on the current requisition, and (ii) state the total amount of retainage to date, exclusive of any amount retained on the current requisition.

ARTICLE 18. ASSIGNMENTS

18.1 The Contractor shall not assign, transfer, convey or otherwise dispose of this Contract, or the right to execute it, or the right, title or interest in or to it or any part thereof, or assign, by power of attorney or otherwise any of the monies due or to become due under this Contract, unless the previous written consent of the Commissioner shall first be obtained thereto, and the giving of any such consent to a particular assignment shall not dispense with the necessity of such consent to any further or other assignments.

18.2 Such assignment, transfer, or conveyance shall not be valid until filed in the office of the Commissioner and the Treasurer, with the written consent of the Commissioner endorsed thereon or attached thereto.

18.3 Failure to obtain the previous written consent of the Commissioner to such an assignment, transfer or conveyance, may result in the revocation and annulment of this Contract. The City shall thereupon be relieved and discharged from any further liability to the Contractor, its assignees, transferees or sublessees, who shall forfeit and lose all monies therefor earned under the Contract, except so much as may be required to pay the Contractor's employees.

18.4 The provisions of this clause shall not hinder, prevent, or affect an assignment by the Contractor for the benefit of its creditors made pursuant to the Laws of the State of New York.

18.5 This Contract may be assigned by the City to any corporation, agency or instrumentality having authority to accept such assignment.

CHAPTER V CONTRACTOR'S SECURITY AND GUARANTY

ARTICLE 19. SECURITY DEPOSIT

19.1 The bid deposit, if required, shall be retained by the Comptroller as security for the Contractor's faithful performance of the Contract and will be returned to the Contractor only after the sum retained under Article 21 equals the amount of the bid deposit, subject to the other provisions of this Contract. If performance and payment bonds are required, any bid security posted shall be returned within a reasonable time after posting of such bonds and execution of this Contract by the City. When no partial payments are provided, the bid deposit will be released when final payment is certified to the Comptroller for payment.

19.2 If the Contractor is declared in default under Article 48 prior to the return of the deposit, or if any claim is made such as referred to in Article 23, the amount of such deposit, or so much thereof as the Comptroller may deem necessary, may be retained and then applied by the Comptroller:

19.2.1 To compensate the City for any expense, loss or damage suffered or incurred by reason of or resulting from such default, including the cost of re-letting and liquidated damages; or

19.2.2 To indemnify the City against any and all claims.

ARTICLE 20. PAYMENT GUARANTEE

20.1 On Contracts where 100% performance bonds and payment bonds are executed, this article does not apply.

20.2 In the event the terms of this **Contract** do not require the **Contractor** to provide a payment bond, the **City** shall, in accordance with the terms of this article, guarantee payment of all lawful demands for:

20.2.1 Wages and compensation for labor performed and/or services rendered; and

20.2.2 Materials, equipment, and supplies provided, whether incorporated into the **Work** or not, when demands have been filed with the **City** as provided hereinafter by any person, firm, or corporation which furnished labor, material, equipment, supplies, or any combination thereof, in connection with the **Work** performed hereunder (hereinafter referred to as the "beneficiary") at the direction of the **City** or the **Contractor**.

20.3 The provisions of Article 20.2 are subject to the following limitations and conditions:

20.3.1 The guarantee is made for the benefit of all beneficiaries as defined in Article 20.2 provided that those beneficiaries strictly adhere to the terms and conditions of this Article 20.3.

20.3.2 Nothing in this article shall prevent a beneficiary providing labor, services or material for the **Work** from suing the **Contractor** for any amounts due and owing the beneficiary by the **Contractor**.

20.3.3 All demands made against the **City** pursuant to this article shall be made within four (4) months from the date payment is due on the invoice or invoices submitted by the beneficiary to the **Contractor** for labor or **Work** done or for materials or supplies delivered, or, if the demand is for wages, four (4) months from the date the wages were due to be paid to the beneficiary.

20.3.4 All demands made against the **City** by such beneficiary shall be presented to the **Engineer** along with all written documentation concerning the demand which the **Engineer** deems appropriate or necessary, which may include, but shall not be limited to: the subcontract; any invoices presented to the **Contractor** for payment; the notarized statement of the beneficiary that the demand is due and payable, that a request for payment has been made of the **Contractor** and that the demand has not been paid by the **Contractor** within the time allowed for such payment by the subcontract; and copies of any correspondence between the beneficiary and the **Contractor** concerning such demand. The **City** shall notify the **Contractor** that a demand has been made. The **Contractor** shall inform the **City** of any defenses to the demand, and shall forward to the **City** any documents the **City** requests concerning the demand.

20.3.5 The **City** shall make payment only if, after considering all defenses presented by the **Contractor**, it determines that the payment is due and owing to the beneficiary making the demand.

20.3.6 The **City** will not initiate the payment process of this article or make payment on a demand where the beneficiary making the demand has filed a lien against the **Work** or otherwise sues the **City** prior to receiving a written notice from the **City** that it will not pay the demand.

20.3.7 No beneficiary shall be entitled to interest from the **City**, or to any other costs, including, but not limited to, attorney's fees.

20.4 Upon the receipt by the **City** of a demand pursuant to this article, the **City** may withhold from any payment otherwise due and owing to the **Contractor** under this **Contract** an amount sufficient to satisfy the demand.

20.4.1 In the event the **City** determines that the demand is valid, the **City** shall notify the **Contractor** of such determination and the amount thereof, and direct the **Contractor** to immediately pay such amount to the beneficiary. In the event the **Contractor**, within seven (7) days of receipt of such notification from the **City**, fails to pay the beneficiary, such failure shall constitute an automatic

and irrevocable assignment of payment by the **Contractor** to the beneficiary for the amount of the demand determined by the **City** to be valid. The **Contractor**, without further notification or other process, hereby gives its unconditional consent to such assignment of payment to the beneficiary and authorizes the **City**, on its behalf, to take all necessary actions to implement such assignment of payment, including without limitation the execution of any instrument or documentation necessary to effectuate such assignment.

In the event that the amount otherwise due and owing to the **Contractor** by the **City** is insufficient to satisfy such demand, the **City** may, at its option, require payment from the **Contractor** of an amount sufficient to cover such demand and exercise any other right to require or recover payment which the **City** may have under Law or Contract.

20.4.2 In the event the **City** determines that the demand is invalid, any amount withheld pending the **City's** review of such demand shall be paid to the **Contractor**; provided, however, no lien has been filed. In the event a lien has been filed, the terms and conditions set forth in Article 23 shall apply.

20.5 The provisions of this article shall not prevent the **City** and the **Contractor** from resolving disputes in accordance with the **PPB Rules**, where applicable.

20.6 In the event the **City** determines that the beneficiary is entitled to payment pursuant to this article, such determination and any defenses and counterclaims raised by the **Contractor** shall be taken into account in evaluating the **Contractor's** performance.

20.7 Nothing in this article shall relieve the **Contractor** of the obligation to pay the claims of all persons with valid and lawful claims against the **Contractor** relating to the **Work**.

20.8 The **Contractor** shall not require any performance, payment or other bonds of any **Subcontractor** if this Contract does not require such bonds of the **Contractor**.

20.9 The payment guarantee made pursuant to this article shall be construed in a manner consistent with Section 137 of the State Finance Law and shall afford to persons furnishing labor or materials to the **Contractor** or his **Subcontractors** in the prosecution of the **Work** under this Contract all of the rights and remedies afforded to such persons by such section, including but not limited to, the right to commence an action against the **City** on the payment guarantee provided by this article within the one year limitations period set forth in Section 137(4)(b).

ARTICLE 21. RETAINED PERCENTAGE

21.1 If this Contract requires 100% performance and payment security, then as further security for the faithful performance of this Contract, the **Commissioner** shall deduct, and retain until the substantial completion of the **Work**, five (5%) percent of the value of **Work** certified for payment in each partial payment voucher.

21.2 If this Contract does not require 100% performance and payment security and if the price for which this Contract was awarded does not exceed \$500,000, then as further security for the faithful performance of this Contract, the **Commissioner** shall deduct, and retain until the substantial completion of the **Work**, ten (10%) percent of the value of **Work** certified for payment in each partial payment voucher.

21.3 If this Contract does not require 100% performance and payment security and if the price for which this Contract was awarded exceeds \$500,000, then as further security for the faithful performance of this Contract, the **Commissioner** shall deduct, and retain until the substantial completion of the **Work**, up to ten (10%) percent of the value of **Work** certified for payment in each partial payment voucher. The percentage to be retained is set forth in Schedule A of the General Conditions.

ARTICLE 22. INSURANCE

22.1 Types of Insurance: From the date the Contractor is required to provide Proof of Insurance pursuant to Article 22.3.1 through the date of completion of all required Work (including punch list work as certified in writing by the Resident Engineer), the Contractor shall effect and maintain the following types of insurance if and as indicated in Schedule A of the General Conditions (with the minimum limits and special conditions specified in Schedule A). Such insurance shall be issued by companies that meet the standards of Article 22.2.1 and shall be primary (and non-contributing) to any insurance or self-insurance maintained by the City.

22.1.1 Commercial General Liability Insurance: The Contractor shall provide a Commercial General Liability Insurance policy covering the Contractor as Named Insured and the City as an Additional Insured. This policy shall protect the City and the Contractor from claims for property damage and/or bodily injury, including death, which may arise from any of the operations under this Contract. Coverage under this policy shall be at least as broad as that provided by ISO Form CG 0001 (10/01 ed.), must be "occurrence" based rather than "claims-made", and shall include, without limitation, the following types of coverage: Premises Operations, Products and Completed Operations, Contractual Liability (including the tort liability of another assumed in a contract), Broad Form Property Damage, Medical Payments, Independent Contractors, Personal Injury (Contractual Exclusion deleted), Explosion, Collapse and Underground Property, and Incidental Malpractice. If such insurance contains an aggregate limit, it shall apply separately to this Project.

22.1.1(a) Such Commercial General Liability Insurance shall name the City, together with its officials and employees, as an Additional Insured under this policy. Coverage for the City as Additional Insured shall specifically include the City's officials and employees, and shall be at least as broad as either Insurance Services Office ("ISO") Form CG 20 10 (07/04 ed.) or Form CG 20 33 (07/04 ed.) and shall provide completed operations coverage at least as broad as CG 20 37 (07/04 ed.).

22.1.1(b) If this Contract is equal to or greater than Ten Million Dollars (\$10,000,000.00), each Commercial General Liability Insurance policy provided shall contain each of the following endorsements:

22.1.1(b)(i) The Duties in the Event of Occurrence, Claim or Suit condition of the policy is amended per the following: If and insofar as knowledge of an "occurrence", "claim", or "suit" is relevant to the City of New York as Additional Insured under this policy, such knowledge by an agent, servant, official, or employee of the City of New York will not be considered knowledge on the part of the City of New York of the "occurrence", "claim", or "suit" unless the following position shall have received notice thereof from such agent, servant, official, or employee: Insurance Claims Specialist, Affirmative Litigation Division, New York City Law Department; and

22.1.1(b)(ii) Any notice, demand or other writing by or on behalf of the Named Insured to the Insurance Company shall also be deemed to be a notice, demand, or other writing on behalf of the City as Additional Insured. Any response by the Insurance Company to such notice, demand or other writing shall be addressed to Named Insured and to the City at the following addresses: Insurance Unit, NYC Comptroller's Office, 1 Centre Street - Room 1222, New York, N.Y. 10007; and Insurance Claims Specialist, Affirmative Litigation Division, New York City Law Department, 100 Church Street, New York, NY 10007.

22.1.2 **Workers' Compensation Insurance and Disability Benefits Insurance:** The Contractor shall provide, and ensure that each Subcontractor provides, Workers Compensation Insurance and Disability Benefits Insurance in accordance with the Laws of the State of New York on behalf of all employees providing services under this Contract (except for those qualifying for insurance pursuant to Article 22.1.4).

22.1.3 **Employers' Liability Insurance:** The Contractor shall provide, and ensure that each Subcontractor provides, Employers Liability Insurance affording compensation due to bodily injury by accident or disease sustained by any employee arising out of and in the course of his/her employment under this Contract (except for those qualifying for insurance pursuant to Article 22.1.4).

22.1.4 **United States Longshoremen's and Harbor Workers Act and/or Jones Act Insurance:** The Contractor shall provide, and ensure that each Subcontractor provides, insurance in accordance with the United States Longshoremen's and Harbor Workers Act and/or the Jones Act, on behalf of all qualifying employees providing services under this Contract.

22.1.5 **Builders' Risk Insurance:** The Contractor shall provide a Builders' Risk Insurance policy covering all risks in completed value form. Such policy shall cover the total value of the Work performed in accordance with Schedule A, as well as the value of any equipment, supplies and/or material for the Project that may be in storage (on or off the Site) or in transit. The policy shall cover the cost of removing debris, including demolition as may be legally necessary by the operation of any law, ordinance or regulation, and for loss or damage to any owned, borrowed, leased or rented capital equipment, tools, including tools of their agents and employees, staging towers and forms, and property of the City held in their care, custody and/or control. Such policy shall name as insureds the City, the Contractor, and its Subcontractors. The Builders' Risk policy shall contain the following endorsements:

22.1.5(a) The City and the Contractor shall be named as loss payee for the Work in order of precedence, as their interest may appear; and

22.1.5(b) In the event the loss occurs at an occupied facility, the policy shall permit occupancy without the consent of the Insurance Company; and

22.1.5(c) In the event that the insurance policy has been issued by a mutual insurance company, the following language shall be included: "The City of New York is not liable for any premium or assessment under this policy of insurance. The First Named Insured is solely liable therefor."

22.1.6 **Comprehensive Business Automobile Liability Insurance:** The Contractor shall provide a Comprehensive Business Automobile Liability policy for liability arising out of any owned, non-owned, leased and hired vehicles to be used in connection with this Contract. Coverage should be at least as broad as ISO Form CA0001, ed. 10/01.

22.1.6(a) If autos are used for transporting hazardous materials, the Automobile Liability Insurance shall be endorsed to provide pollution liability broadened coverage for covered vehicles (endorsement CA 99 48) as well as proof of MCS 90.

22.1.7 **Pollution/Environmental Liability Insurance:** The Contractor shall provide Pollution/Environmental Liability Insurance covering bodily injury and property damage, including loss of use of damaged property or of property that has not been physically injured. Such insurance shall provide coverage for actual, alleged or threatened emission, discharge, dispersal, seepage, release or escape of pollutants (including asbestos), including any loss, cost or expense incurred as a

result of any cleanup of pollutants (including asbestos) or in the investigation, settlement or defense of any claim, suit, or proceedings against the City arising from the operations under this Contract. Such insurance shall be in the Contractor's name and list the City as an Additional Insured. Coverage for the City as Additional Insured shall specifically include the City's officials and employees, and shall be at least as broad as provided to the Contractor for this Project.

22.1.7(a) If such coverage is written on a claims-made policy, such policy shall have a retroactive date on or before the effective date of this Contract, and continuous coverage shall be maintained, or an extended discovery period exercised, for a period of not less than three years from the time the Work under this Contract is completed.

22.1.8 Marine Insurance:

22.1.8(a) Marine Protection and Indemnity Insurance: The Contractor shall provide a Marine Protection and Indemnity policy with coverage at least as broad as policy form SP-23. The policy shall provide coverage for the Contractor and for the City (together with its officials and employees) as Additional Insured for bodily injury and property damage arising from marine operations under this Contract including injury or death of crew members (if not fully provided through other insurance), damage to piers, wharves and other fixed or movable structures and loss of or damage to any other vessel or craft, or to property on such other vessel or craft, not caused by collision.

22.1.8(b) Ship Repairers Legal Liability Insurance: The Contractor shall provide a Ship Repairers Legal Liability Insurance policy covering all repair operations under this Contract at or in the vicinity of a designated approved port or yard under this Contract. The policy shall provide coverage from the point of acceptance of care custody and control of any City vessel. The policy shall provide Bailee Coverage for any City vessel in the Contractor's care, custody and control and coverage for damage to property of others caused by any City vessel in the Contractor's care custody and control.

22.1.8(c) Collision Liability/Towers Liability Insurance: The Contractor shall provide a Collision Liability/Towers Liability Insurance policy with coverage for the Contractor and for the City (together with its officials and employees) as Additional Insured at least as broad as the American Institute Tug Form (08/01/76) for all tugs used under this Contract and Collision Liability per American Institute Hull Clauses (6/2/77).

22.1.8(d) Marine Pollution Liability Insurance: The Contractor shall provide a Marine Pollution Liability Insurance policy covering itself as Named Insured and the City (together with its officials and employees) as Additional Insured for liability arising from the discharge or substantial threat of a discharge of oil, or from the release or threatened release of a hazardous substance including injury to, or economic losses resulting from, the destruction of or damage to real property, personal property or natural resources. Coverage under this policy shall be at least as broad as that provided by Water Quality Insurance Syndicate Form (09/98 ed.).

22.1.9 The Contractor shall provide such other types of insurance, at such minimum limits, as are specified in Schedule A of the General Conditions.

22.2 General Requirements for Insurance Policies:

22.2.1 All required insurance policies shall be maintained with companies that may lawfully issue the required policy and have an A.M. Best rating of at least A- VII or a Standard and Poor's rating of at least AA, unless prior written approval is obtained from the Mayor's Office of Operations.

22.2.2 The Contractor shall be solely responsible for the payment of all premiums for all required policies and all deductibles and self-insured retentions to which such policies are subject, whether or not the City is an insured under the policy.

22.2.3 In his/her sole discretion, the Commissioner may, subject to the approval of the Comptroller and the Corporation Counsel, accept Letters of Credit and/or custodial accounts in lieu of required insurance.

22.2.4 The City's limits of coverage for all types of insurance required pursuant to Schedule A of the General Conditions shall be the greater of (i) the minimum limits set forth in Schedule A or (ii) the limits provided to the Contractor as Named Insured under all primary, excess and umbrella policies of that type of coverage.

22.2.5 All required insurance policies, except for insurance required pursuant to Sections 22.1.2, 22.1.3, and 22.1.4, shall contain the following endorsement: "This policy may not be cancelled, terminated, modified or changed unless thirty (30) days prior written notice is sent by the Insurance Company to the Named Insured (or First Named Insured, as appropriate), the Commissioner, and to the Comptroller, attn: Office of Contract Administration, Municipal Building, Room 1005, New York, New York 10007."

22.3 Proof of Insurance:

22.3.1 Within ten (10) Days of award, the Contractor shall, for each policy required under this Contract, except for Workers Compensation Insurance and Disability Benefits Insurance and builders' risk insurance, file a Certificate of Insurance with the Commissioner pursuant to Article 22.6. For Workers' Compensation Insurance and Disability Benefits Insurance, the Contractor shall file proof of insurance in a form acceptable to the Commissioner within ten (10) Days of award. ~~Accord forms are not acceptable proof of workers' compensation coverage. The Contractor must submit one of the following forms to the Department, or another form acceptable to the Department: C-105.2 -- Certificate of Workers' Compensation Insurance, or U-26.3 -- State Insurance Fund Certificate of Workers' Compensation Insurance. For builders' risk insurance, the Contractor shall file a Certificate of Insurance with the Commissioner at the direction of the Commissioner but in any event no later than ten (10) Days prior to commencement of the Work.~~

22.3.1(a) All Certificates of Insurance shall be in a form acceptable to the City and shall certify the issuance and effectiveness of the types of insurance specified in Schedule A, each with the specified minimum limits and evidence of the compliance with the Additional Insured or Named Insured provisions of Articles 22.1.1(a), 22.1.5, 22.1.7, and 22.1.8, as applicable. All Certificate(s) of Insurance shall be accompanied by either a duly executed "Certification by Broker" in the form contained in Part II of Schedule A or completed copies of all policies referenced in the Certificate of Insurance. In the absence of completed policies, binders are acceptable.

22.3.2 Certificates of Insurance confirming renewals of insurance shall be submitted to the Commissioner prior to the expiration date of coverage of policies required under this Contract. Such Certificates of Insurance shall comply with the requirements of Article 22.3.1(a) and, if applicable, Article 22.3.1(b).

22.3.3 The Contractor shall be obligated to provide the City with a copy of any policy required by this Article 22 upon the demand for such policy by the Commissioner or the New York City Law Department.

22.4 Operations of the Contractor:

22.4.1 The Contractor shall not commence the Work unless and until all required certificates have been submitted to and accepted by the Commissioner. Acceptance by the Commissioner of a certificate hereunder does not excuse the Contractor from securing a policy consistent with all provisions of this Article or of any liability arising from its failure to do so.

22.4.2 The Contractor shall be responsible for providing continuous insurance coverage in the manner, form, and limits required by this Contract and shall be authorized to perform Work only during the effective period of all required coverage.

22.4.3 In the event that any of the required insurance policies lapse, are revoked, suspended or otherwise terminated, for whatever cause, the Contractor shall immediately stop all Work, and shall not recommence Work until authorized in writing to do so by the Commissioner. Upon quitting the Site, except as otherwise directed by the Commissioner, the Contractor shall leave all plant, materials, equipment, tools and supplies on the Site. Contract time shall continue to run during such periods and no extensions of time will be granted. The Commissioner may also declare the Contractor in default for failure to maintain required insurance.

22.5 The City as Additional Insured or Loss Payee under Subcontractors' Insurance. The Contractor shall ensure that each Subcontractor name the City as Additional Insured or loss payee, as appropriate, under all policies covering Work performed by such Subcontractor under this Contract. The City's coverage as Additional Insured shall include the City's officials and employees and be at least as broad as that provided to the Contractor. The foregoing requirements shall not apply to insurance provided pursuant to Articles 22.1.2, 22.1.3, and 22.1.4.

22.6 Wherever reference is made in Article 7 or this Article 22 to documents to be sent to the Commissioner (e.g., notices, filings, or submissions), such documents shall be sent to the address set forth in Schedule A of the General Conditions. In the event no address is set forth in Schedule A, such documents are to be sent to the Commissioner's address as provided elsewhere in this Contract.

22.7 If the Contract involves disposal of hazardous materials, the Contractor shall dispose such materials only at sites where the disposal site operator maintains Pollution Legal Liability Insurance in the amount of at least \$2,000,000 for losses arising from such disposal site.

22.8 Materiality/Non-Waiver: The Contractor's failure to secure policy(ies) in complete conformity with this Article, or to give the Insurance Company timely notice of any sort required in this Contract on behalf of the City, or to do anything else required by this Article shall constitute a material breach of this Contract. Such breach shall not be waived or otherwise excused by any action or inaction by the City at any time.

22.9 Other Remedies: Insurance coverage in the minimum amounts provided for herein shall not relieve the Contractor or Subcontractors of any liability under this Contract, nor shall it preclude the City from exercising any rights or taking such other actions as are available to it under any other provisions of this Contract or Law.

ARTICLE 23. MONEY RETAINED AGAINST CLAIMS

23.1 If any claim shall be made by any person or entity (including **Other Contractors** with the City on this Project) against the City or against the Contractor and the City for any of the following:

- (a) An alleged loss, damage, injury, theft or vandalism of any of the kinds referred to in Articles 7 and 12, plus the reasonable costs of defending the City, which in the opinion of the Comptroller may not be paid by an insurance company (for any reason whatsoever); or
- (b) An infringement of copyrights, patents or use of patented articles, tools, etc., as referred to in Article 57; or
- (c) Damage claimed to have been caused directly or indirectly by the failure of the Contractor to perform the Work in strict accordance with this Contract,

the amount of such claim, or so much thereof as the Comptroller may deem necessary, may be withheld by the Comptroller, as security against such claim, from any money due hereunder. The Comptroller, in his/her discretion, may permit the Contractor to substitute other satisfactory security in lieu of the monies so withheld.

23.2 If an action on such claim is timely commenced and the liability of the City, or the Contractor, or both, shall have been established therein by a final judgment of a Court of competent jurisdiction, or if such claim shall have been admitted by the Contractor to be valid, the Comptroller shall pay such judgment or admitted claim out of the monies retained by the Comptroller under the provisions of this article, and return the balance, if any, without interest, to the Contractor.

23.3 Liens: If at any time before or within thirty (30) Days after the Work is completed and accepted by the City, any persons claiming to have performed any labor or furnished any material toward the performance or completion of this Contract, shall file with the Agency and with the Treasurer any notice as is described in the New York State Lien Law, or any act of the Legislature of the State of New York, the City shall retain, from the monies due or to become due under this Contract, so much of such monies as shall be sufficient to pay the amount claimed in said notice, together with the reasonable costs of any action or actions brought or that may be brought to enforce such lien. The monies so retained shall be held by the City until the lien thereon created by the said act and the filing of the said notice shall be discharged pursuant to Law.

ARTICLE 24. MAINTENANCE AND GUARANTY

24.1 The Contractor shall promptly repair, replace, restore or rebuild, as the Commissioner may determine, any finished Work in which defects of materials or workmanship may appear or to which damage may occur because of such defects, during the one (1) year period subsequent to the date of Substantial Completion (or use and occupancy in accordance with Article 16), except where other periods of maintenance and guarantee are provided for.

24.2 As security for the faithful performance of its obligations hereunder, the Contractor, upon filing its requisition for payment on Substantial Completion, shall deposit with the Commissioner a sum equal to one (1%) percent of the price (or the amount fixed in Schedule A of the General Conditions) in cash or certified check upon a state or national bank and trust company or a check of such bank and trust company signed by a duly authorized officer thereof and drawn to the order of the Comptroller, or obligations of the City, which the Comptroller may approve as of equal value with the sum so required.

24.3 In lieu of the above, the Contractor may make such security payment to the City by authorizing the Commissioner in writing to deduct the amount from the Substantial Completion payment which shall be deemed the deposit required above.

24.4 If the Contractor has faithfully performed all of its obligations hereunder the Commissioner shall so certify to the Comptroller within five (5) Days after the expiration of one (1) year from the date of Substantial Completion and acceptance of the Work or within thirty (30) Days after the expiration of the guarantee period fixed in the Specifications. The security payment shall be repaid to the Contractor without interest within thirty (30) Days after certification by the Commissioner to the Comptroller that the Contractor has faithfully performed all of its obligations hereunder.

24.5 Notice by the Commissioner to the Contractor to repair, replace, rebuild or restore such defective or damaged Work shall be timely, pursuant to this article, if given not later than ten (10) Days subsequent to the expiration of the one (1) year period or other periods provided for herein.

24.6 If the Contractor shall fail to repair, replace, rebuild or restore such defective or damaged Work promptly after receiving such notice, the Commissioner shall have the right to have the Work done by others in the same manner as provided for in the completion of a defaulted Contract, under Article 51.

24.7 If the security payment so deposited is insufficient to cover the cost of such Work, the Contractor shall be liable to pay such deficiency on demand by the Commissioner.

24.8 The Engineer's certificate setting forth the fair and reasonable cost of repairing, replacing, rebuilding or restoring any damaged or defective Work when performed by one other than the Contractor, shall be binding and conclusive upon the Contractor as to the amount thereof.

24.9 The Contractor shall obtain all manufacturers' warranties and guaranties of all equipment and materials required by this Contract in the name of the City and shall deliver same to the Commissioner. All of the City's rights and title and interest in and to said manufacturers' warranties and guaranties may be assigned by the City to any subsequent purchasers or lessees of the premises.

CHAPTER VI CHANGES, EXTRA WORK AND DOCUMENTATION OF CLAIM

ARTICLE 25. CHANGES

25.1 Changes may be made to this Contract only as duly authorized in writing by the Commissioner in accordance with the Laws and this Contract. All such changes, modifications and amendments will become a part of the Contract. Work so ordered shall be performed by the Contractor.

25.2 Contract changes will be made only for Work necessary to complete the Work included in the original scope of the Contract and/or for non-material changes to the scope of the Contract. Changes are not permitted for any material alteration in the scope of Work in the Contract.

25.3 The Contractor shall be entitled to a price adjustment for Extra Work performed pursuant to a written change order. Adjustments to price shall be computed in one or more of the following ways:

25.3.1 By applicable unit prices specified in the Contract; and/or

25.3.2 By agreement of a fixed price; and/or

25.3.3 By time and material records; and/or

25.3.4 In any other manner approved by the CCPO.

25.4 All payments for change orders are subject to pre-audit by the Engineering Audit Officer and may be post-audited by the Comptroller and/or the Department.

ARTICLE 26. METHODS OF PAYMENT FOR OVERRUNS AND EXTRA WORK

26.1 Overrun of Unit Price Item: An overrun is any quantity of a unit price item which the Contractor is directed to provide which is in excess of one hundred twenty-five (125%) percent of the estimated quantity for that item set forth in the bid schedule.

26.1.1 For any unit price item, the Contractor will be paid at the unit price bid for any quantity up to one hundred twenty five (125%) percent of the estimated quantity for that item set forth in the bid schedule. If during the progress of the Work, the actual quantity of any unit price item required to complete the Work approaches the estimated quantity for that item, and for any reason it appears that the actual quantity of any unit price item necessary to complete the Work will exceed the estimated quantity for that item by twenty-five (25%) percent, the Contractor shall immediately notify the Engineer of such anticipated overrun. The Contractor shall not be compensated for any quantity of a unit price item provided which is in excess of one hundred twenty five (125%) percent of the estimated quantity for that item set forth in the bid schedule without written authorization from the Engineer.

26.1.2 If the actual quantity of any unit price item necessary to complete the Work will exceed one hundred twenty five (125%) percent of the estimated quantity for that item set forth in the bid schedule, the City reserves the right and the Contractor agrees to negotiate a new unit price for such item. In no event shall such negotiated new unit price exceed the unit bid price. If the City and Contractor cannot agree on a new unit price, then the City shall order the Contractor and the Contractor agrees to provide additional quantities of the item on a time and material basis for the actual and reasonable cost as determined under Article 26.2, but in no event at a unit price exceeding the unit price bid.

26.2 Extra Work: For Extra Work where payment is by agreement on a fixed price in accordance with Article 25.3.2, the price to be paid for such Extra Work shall be based on the fair and reasonable estimated cost of the items set forth below. For Extra Work where payment is on a time and material basis in accordance with Article 25.3.3, the price to be paid for such Extra Work shall be the actual and reasonable cost of the items set forth below.

26.2.1 Necessary materials (including transportation to the Site); plus

26.2.2 Necessary direct labor, including payroll taxes and supplemental benefits; plus

26.2.3 Sales and personal property taxes, if any, required to be paid on materials not incorporated into such Extra Work; plus

26.2.4 Reasonable rental value of Contractor-owned, necessary plant and equipment other than small tools, plus fuel/energy costs. Except for fuel costs for pick-up trucks which shall be reimbursed based on a consumption of five (5) gallons per shift, fuel costs shall be reimbursed based on actual costs or, in the absence of auditable documentation, the following fuel consumption formula per operating hour: $(.035) \times (\text{HP rating}) \times (\text{Fuel cost/gallon})$. Reasonable rental value is defined as the lower of either seventy-five percent of the monthly prorated rental rates established in "The AED Green Book, Rental Rates and Specifications for Construction Equipment" published by PRIMEDIA (the "Green Book"), or seventy-five percent of the monthly prorated rental rates established in the "Rental Rate Blue Book for Construction Equipment" published by PRIMEDIA (the "Blue Book"). The reasonable rental value is inclusive of all operating costs except for fuel/energy consumption and equipment operator's wages/costs. For multiple shift utilization, reimbursement shall be calculated as follows: first shift shall be seventy-five percent of such rental rates; second shift shall be sixty percent of the first shift rate; and third shift shall be forty

percent of the first shift rate. Equipment on standby shall be reimbursed at one-third the prorated monthly rental rate. Contractor-owned equipment includes equipment from rental companies affiliated with or controlled by the Contractor, as determined by the Commissioner. In establishing cost reimbursement for non-operating contractor-owned equipment (scaffolding, sheeting systems, road plates, etc.), the City may restrict reimbursement to a purchase-salvage/life cycle basis if less than the computed rental costs; plus

26.2.5 Necessary installation and dismantling of such plant and equipment, including transportation to and from the Site, if any, provided that, in the case of non-Contractor-owned equipment rented from a third party, the cost of installation and dismantling are not allowable if such costs are included in the rental rate; plus

26.2.6 Reasonable rental costs of non-Contractor-owned necessary plant and equipment other than small tools, plus fuel/energy costs. Except for fuel costs for pick-up trucks which shall be reimbursed based on a consumption of five (5) gallons per shift, fuel costs shall be reimbursed based on actual costs or, in the absence of auditable documentation, the following fuel consumption formula per hour of operation: $(.035) \times (\text{HP rating}) \times (\text{Fuel cost/gallon})$. In lieu of renting, the City reserves the right to direct the purchase of non-operating equipment (scaffolding, sheeting systems, road plates, etc.), with payment on a purchase-salvage/life cycle basis, if less than the projected rental costs; plus

26.2.7 Workers' compensation insurance, and any insurance coverage expressly required by the City for the performance of the Extra Work which is different than the types of insurance required by Article 22 and Schedule A of the General Conditions. The cost of workers' compensation insurance shall be based upon the Manual Rate for such insurance for the applicable work classifications/codes, in accordance with the most recent schedule promulgated by the New York Compensation Insurance Rating Board; plus

26.2.8 Additional costs incurred as a result of the Extra Work for performance and payment bonds; plus

26.2.9 Ten (10%) percent of the total of items in Articles 26.2.1 through 26.2.5 as compensation for overhead, except that no percentage for overhead will be allowed on Payroll Taxes or on the premium portion of overtime pay or on sales and personal property taxes. Overhead shall include without limitation, all costs and expenses in connection with administration, management superintendence, small tools, and insurance required by Schedule A of the General Conditions other than workers' compensation insurance; plus

26.2.10 Ten (10%) percent of the total of items in Articles 26.2.1 through 26.2.5, plus item 26.2.9, as compensation for profit, except that no percentage for profit will be allowed on Payroll Taxes or on the premium portion of overtime pay or on sales and personal property taxes; plus

26.2.11 Five (5%) percent of the total of items in Article 26.2.6, 26.2.7, and 26.2.8 as compensation for overhead and profit.

26.3 Where the Extra Work is performed in whole or in part by other than the Contractor's own forces pursuant to Article 26.2, the Contractor shall be paid, subject to pre-audit by the Engineering Audit Officer, the cost of such Work computed in accordance with Article 26.2 above, plus an additional allowance of five (5%) percent to cover the Contractor's overhead and profit.

26.4 Where a change is ordered, involving both Extra Work and omitted or reduced Contract Work, the Contract price shall be adjusted, subject to pre-audit by the EAO, in an amount based on the difference between the cost of such Extra Work and of the omitted or reduced Work. The cost of such Extra Work and of such omitted or reduced Work shall be computed based upon applicable Contract unit prices. Where there are no applicable Contract unit prices, the cost of such Extra Work and of such omitted or reduced Contract Work shall

be computed in accordance with items 26.2.1 through 26.2.8. If the cost of such **Extra Work** exceeds the costs of such omitted or reduced **Contract Work**, the **Contract** price shall be increased by the difference, plus percentages for overhead and profit as provided in Articles 26.2.9 through 26.2.11. If the cost of the omitted or reduced **Contract Work** exceeds the cost of the **Extra Work**, then the **Contract** price shall be reduced by the difference.

26.5 Where the **Contractor** and the **Commissioner** can agree upon a fixed price for **Extra Work** in accordance with Article 25.3.2 or another method of payment for **Extra Work** in accordance with Article 25.3.4, or for **Extra Work** ordered in connection with omitted work, such method, subject to pre-audit by the **EAO**, may, at the option of the **Commissioner**, be substituted for the cost plus a percentage method provided in Article 26.2; provided, however, that if the **Extra Work** is performed by a **Subcontractor**, the **Contractor** shall not be entitled to receive more than an additional allowance of five (5%) percent for overhead and profit over the cost of such **Subcontractor's Work** as computed in accordance with Article 26.2.

ARTICLE 27. RESOLUTION OF DISPUTES

27.1 All disputes between the **City** and the **Contractor** of the kind delineated in this article that arise under, or by virtue of, this **Contract** shall be finally resolved in accordance with the provisions of this article and the **PPB** Rules. This procedure for resolving all disputes of the kind delineated herein shall be the exclusive means of resolving any such disputes.

27.1.1 This article shall not apply to disputes concerning matters dealt with in other sections of the **PPB** Rules, or to disputes involving patents, copyrights, trademarks, or trade secrets (as interpreted by the courts of New York State) relating to proprietary rights in computer software.

27.1.2 This article shall apply only to disputes about the scope of work delineated by the **Contract**, the interpretation of **Contract** documents, the amount to be paid for **Extra Work** or disputed work performed in connection with the **Contract**, the conformity of the **Contractor's Work** to the **Contract**, and the acceptability and quality of the **Contractor's Work**; such disputes arise when the **Engineer**, **Resident Engineer**, **Engineering Audit Officer**, or other designee of the **Commissioner** makes a determination with which the **Contractor** disagrees.

27.2 All determinations required by this article shall be made in writing clearly stated, with a reasoned explanation for the determination based on the information and evidence presented to the party making the determination. Failure to make such determination within the time required by this article shall be deemed a non-determination without prejudice that will allow application to the next level.

27.3 During such time as any dispute is being presented, heard, and considered pursuant to this article, the **Contract** terms shall remain in force and the **Contractor** shall continue to perform **Work** as directed by the **ACCO** or the **Engineer**. Failure of the **Contractor** to continue **Work** as directed shall constitute a waiver by the **Contractor** of its claim.

27.4 Presentation of Disputes to Commissioner.

Notice of Dispute and Agency Response. The **Contractor** shall present its dispute in writing ("Notice of Dispute") to the **Commissioner** within thirty (30) Days of receiving written notice of the determination or action that is the subject of the dispute. This notice requirement shall not be read to replace any other notice requirements contained in the **Contract**. The Notice of Dispute shall include all the facts, evidence, documents, or other basis upon which the **Contractor** relies in support of its position, as well as a detailed computation demonstrating how any amount of money claimed by the **Contractor** in the dispute was arrived at. Within thirty (30) Days after receipt of the detailed written submission comprising the complete Notice of Dispute, the **Engineer**, **Resident Engineer**, **Engineering Audit Officer**, or other designee of the **Commissioner** shall submit to the **Commissioner** all materials he or she deems pertinent to the dispute. Following initial submissions to the **Commissioner**, either

party may demand of the other the production of any document or other material the demanding party believes may be relevant to the dispute. The requested party shall produce all relevant materials that are not otherwise protected by a legal privilege recognized by the courts of New York State. Any question of relevancy shall be determined by the Commissioner whose decision shall be final. Willful failure of the Contractor to produce any requested material whose relevancy the Contractor has not disputed, or whose relevancy has been affirmatively determined, shall constitute a waiver by the Contractor of its claim.

27.4.1 Commissioner Inquiry. The Commissioner shall examine the material and may, in his or her discretion, convene an informal conference with the Contractor, the ACCO, and the Engineer, Resident Engineer, Engineering Audit Officer, or other designee of the Commissioner to resolve the issue by mutual consent prior to reaching a determination. The Commissioner may seek such technical or other expertise as he or she shall deem appropriate, including the use of neutral mediators, and require any such additional material from either or both parties as he or she deems fit. The Commissioner's ability to render, and the effect of, a decision hereunder shall not be impaired by any negotiations in connection with the disputed presented, whether or not the Commissioner participated therein. The Commissioner may or, at the request of any party to the dispute, shall compel the participation of any other Contractor with a Contract related to the Work of this Contract, and that Contractor shall be bound by the decision of the Commissioner. Any Contractor thus brought into the dispute resolution proceeding shall have the same rights and obligations under this article as the Contractor initiating the dispute.

27.4.2 Commissioner Determination. Within thirty (30) days after the receipt of all materials and information, or such longer time as may be agreed to by the parties, the Commissioner shall make his or her determination and shall deliver or send a copy of such determination to the Contractor, the ACCO, and Engineer, Resident Engineer, Engineering Audit Officer, or other designee of the Commissioner, as applicable, together with a statement concerning how the decision may be appealed.

27.4.3 Finality of Commissioner Decision. The Commissioner's decision shall be final and binding on all parties, unless presented to the Contract Dispute Resolution Board pursuant to this article. The City may not take a petition to the Contract Dispute Resolution Board. However, should the Contractor take such a petition, the City may seek, and the Contract Dispute Resolution Board may render, a determination less favorable to the Contractor and more favorable to the City than the decision of the Commissioner.

27.5 Presentation of Dispute to the Comptroller. Before any dispute may be brought by the Contractor to the Contract Dispute Resolution Board, the Contractor must first present its claim to the Comptroller for his or her review, investigation, and possible adjustment.

27.5.1 Time, Form, and Content of Notice. Within thirty (30) days of its receipt of a decision by the Commissioner, the Contractor shall submit to the Comptroller and to the Commissioner a Notice of Claim regarding its dispute with the Agency. The Notice of Claim shall consist of (i) a brief Written statement of the substance of the dispute, the amount of money, if any, claimed and the reason(s) the Contractor contends the dispute was wrongly decided by the Commissioner; (ii) a copy of the written decision of the Commissioner; and (iii) a copy of all materials submitted by the Contractor to the Agency, including the Notice of Dispute. The Contractor may not present to the Comptroller any material not presented to the Commissioner, except at the request of the Comptroller.

27.5.2 Agency Response. Within thirty (30) days of receipt of the Notice of Claim, the Agency shall make available to the Comptroller a copy of all material submitted by the Agency to the Commissioner in connection with the dispute. The Agency may not present to the Comptroller any material not presented to the Commissioner except at the request of the Comptroller.

27.5.3 Comptroller Investigation. The Comptroller may investigate the claim in dispute and, in the course of such investigation, may exercise all powers provided in section 7-201 and 7-203 of the New York City Administrative Code. In addition, the Comptroller may demand of either party, and such party shall provide, whatever additional material the Comptroller deems pertinent to the claim, including original business records of the Contractor. Willful failure of the Contractor to produce within fifteen (15) days any material requested by the Comptroller shall constitute a waiver by the Contractor of its claim. The Comptroller may also schedule an informal conference to be attended by the Contractor, Agency representatives, and any other personnel desired by the Comptroller.

27.5.4 Opportunity of Comptroller to Compromise or Adjust Claim. The Comptroller shall have forty-five (45) days from his or her receipt of all materials referred to in Article 27.5.3 to investigate the disputed claim. The period for investigation and compromise may be further extended by agreement between the Contractor and the Comptroller, to a maximum of ninety (90) days from the Comptroller's receipt of all materials. The Contractor may not present its petition to the Contract Dispute Resolution Board until the period for investigation and compromise delineated in Article 27.5.4 has expired. In compromising or adjusting any claim hereunder, the Comptroller may not revise or disregard the terms of the Contract between the parties.

27.6 Contract Dispute Resolution Board. There shall be a Contract Dispute Resolution Board composed of:

27.6.1 The chief administrative law judge of the Office of Administrative Trials and Hearings (OATH) or his/her designated OATH administrative law judge, who shall act as chairperson, and may adopt operational procedures and issue such orders consistent with this article as may be necessary in the execution of the Contract Dispute Resolution Board's functions, including, but not limited to, granting extensions of time to present or respond to submissions;

27.6.1.1 The CCPO or his/her designee; any designee shall have the requisite background to consider and resolve the merits of the dispute and shall not have participated personally and substantially in the particular matter that is the subject of the dispute or report to anyone who so participated; and

27.6.2 A person with appropriate expertise who is not an employee of the City. This person shall be selected by the presiding administrative law judge from a prequalified panel of individuals, established and administered by OATH with appropriate background to act as decision-makers in a dispute. Such individual may not have a contract or dispute with the City or be an officer or employee of any company or organization that does, or regularly represents persons, companies, or organizations having disputes with the City.

27.7 Petition to the Contract Dispute Resolution Board. In the event the claim has not been settled or adjusted by the Comptroller within the period provided in this article, the Contractor, within thirty (30) days thereafter, may petition the Contract Dispute Resolution Board to review the Commissioner's determination.

27.7.1 Form and Content of Petition by Contractor. The Contractor shall present its dispute to the Contract Dispute Resolution Board in the form of a petition, which shall include (i) a brief written statement of the substance of the dispute, the amount of money, if any, claimed, and the reason(s) the Contractor contends the dispute was wrongly decided by the Commissioner; (ii) a copy of the written Decision of the Commissioner, (iii) copies of all materials submitted by the Contractor to the Agency; (iv) a copy of the written decision of the Comptroller, if any, and (v) copies of all correspondence with, or written material submitted by the Contractor, to the Comptroller. The Contractor shall concurrently submit four (4) complete sets of the Petition: one set to the Corporation Counsel (Attn: Commercial and Real Estate Litigation Division) and three (3) sets to the Contract

Dispute Resolution Board at OATH's offices with proof of service on the Corporation Counsel. In addition, the **Contractor** shall submit a copy of the written statement of the substance of the dispute, cited in (i) above, to both the **Commissioner** and the **Comptroller**.

27.7.2 Agency Response. Within thirty (30) Days of its receipt of the petition by the Corporation Counsel, the **Agency** shall respond to the brief written statement of the **Contractor** and make available to the Contract Dispute Resolution Board all material it submitted to the **Commissioner** and **Comptroller**. Three (3) complete copies of the **Agency** response shall be provided to the Contract Dispute Resolution Board and one to the **Contractor**. Extensions of time for submittal of the **Agency** response shall be given as necessary upon a showing of good cause or, upon consent of the parties, for an initial period of up to thirty (30) Days.

27.7.3 Further Proceedings. The Contract Dispute Resolution Board shall permit the **Contractor** to present its case by submission of memoranda, briefs, and oral argument. The Contract Dispute Resolution Board shall also permit the **Agency** to present its case in response to the **Contractor** by submission of memoranda, briefs, and oral argument. If requested by the Corporation Counsel, the **Comptroller** shall provide reasonable assistance in the preparation of the **Agency's** case. Neither the **Contractor** nor the **Agency** may support its case with any documentation or other material that was not considered by the **Comptroller**, unless requested by the Contract Dispute Resolution Board. The Contract Dispute Resolution Board, in its discretion, may seek such technical or other expert advice as it shall deem appropriate and may seek, on its own or upon application of a party, any such additional material from any party as it deems fit. The Contract Dispute Resolution Board, in its discretion, may combine more than one dispute between the parties for concurrent resolution.

27.7.4 Contract Dispute Resolution Board Determination. Within forty-five (45) Days of the conclusion of all written submissions and oral arguments, the Contract Dispute Resolution Board shall render a written decision resolving the dispute. In an unusually complex case, the Contract Dispute Resolution Board may render its decision in a longer period, not to exceed ninety (90) Days, and shall so advise the parties at the commencement of this period. The Contract Dispute Resolution Board's decision must be consistent with the terms of the **Contract**. Decisions of the Contract Dispute Resolution Board shall only resolve matters before the Contract Dispute Resolution Board and shall not have precedential effect with respect to matters not before the Contract Dispute Resolution Board.

27.7.5 Notification of Contract Dispute Resolution Board Decision. The Contract Dispute Resolution Board shall send a copy of its decision to the **Contractor**, the **ACCO**, the **Engineer**, the **Comptroller**, the Corporation Counsel, the Director of the Office of Construction, and the **PPB**. A decision in favor of the **Contractor** shall be subject to the prompt payment provisions of the **PPB** Rules. The Required Payment Date shall be thirty (30) Days after the date the parties are formally notified of the Contract Dispute Resolution Board's decision.

27.7.6 Finality of Contract Dispute Resolution Board Decision. The Contract Dispute Resolution Board's decision shall be final and binding on all parties. Any party may seek review of the Contract Dispute Resolution Board's decision solely in the form of a challenge, filed within four (4) months of the date of the Contract Dispute Resolution Board's decision, in a court of competent jurisdiction of the State of New York, County of New York pursuant to Article 78 of the Civil Practice Laws and Rules. Such review by the court shall be limited to the question of whether or not the Contract Dispute Resolution Board's decision was made in violation of lawful procedure, was affected by an error of Law, or was arbitrary and capricious or an abuse of discretion. No evidence or information shall be introduced or relied upon in such proceeding that was not presented to the Contract Dispute Resolution Board in accordance with this article.

27.8 Any termination, cancellation, or alleged breach of the Contract prior to or during the pendency of any proceedings pursuant to this article shall not affect or impair the ability of the Commissioner or Contract Dispute Resolution Board to make a binding and final decision pursuant to this article.

ARTICLE 28. RECORD KEEPING FOR EXTRA OR DISPUTED WORK

28.1 While the Contractor or any of its Subcontractors is performing Extra Work on a Time and Material Basis ordered by the Commissioner under Article 25, or is performing disputed Work, or complying with a determination or order under protest in accordance with Articles 27 and 30, in each such case the Contractor shall furnish the Resident Engineer daily with three (3) copies of written statements signed by the Contractor's representative at the Site showing:

28.1.1 The name and number of each Worker employed on such Work or engaged in complying with such determination or order, the number of hours employed, and the character of the Work each is doing; and

28.1.2 The nature and quantity of any materials, plant and equipment furnished or used in connection with the performance of such Work or compliance with such determination or order, and from whom purchased or rented.

28.2 A copy of such statement will be countersigned by the Resident Engineer, noting thereon any items not agreed to or questioned, and will be returned to the Contractor within two (2) Days after submission.

28.3 The Contractor and its Subcontractors, when required by the Commissioner, or the Comptroller, shall also produce for inspection, at the office of the Contractor or Subcontractor, any and all of its books, bid documents, financial statements, vouchers, records, daily job diaries and reports, and cancelled checks, and any other documents relating to showing the nature and quantity of the labor, materials, plant and equipment actually used in the performance of such Work, or in complying with such determination or order, and the amounts expended therefor; and shall permit the Commissioner and the Comptroller to make such extracts therefrom, or copies thereof, as they or either of them may desire.

28.4 In connection with the examination provided for herein, the Commissioner, upon demand therefor, will produce for inspection by the Contractor such records as the Agency may have with respect to such Extra or disputed Work performed under protest pursuant to order of the Commissioner, except those records and reports which may have been prepared for the purpose of determining the accuracy and validity of the Contractor's claim.

28.5 Failure to comply strictly with these requirements shall constitute a waiver of any claim for extra compensation or damages on account of the performance of such Work or compliance with such determination or order.

ARTICLE 29. OMITTED WORK

29.1 If any Contract Work in a lump sum Contract, or if any part of a lump sum item in a unit price, lump sum, or percentage-bid Contract is omitted by the Commissioner pursuant to Article 33, the Contract price, subject to audit by the EAO, shall be reduced by a pro rata portion of the lump sum bid amount based upon the percent of Work omitted subject to Article 29.4. For the purpose of determining the pro rata portion of the lump sum bid amount, the bid breakdown submitted in accordance with Article 41 shall be considered, but shall not be the determining factor.

29.2 If the whole of a lump sum item or units of any other item is so omitted by the Commissioner in a unit price, lump sum, or percentage-bid Contract, then no payment will be made therefor except as provided in Article 29.4.

29.3 For units that have been ordered but are only partially completed, the unit price shall be reduced by a pro rata portion of the unit price bid based upon the percentage of Work omitted subject to Article 29.4.

29.4 In the event the Contractor, with respect to any omitted Work, has purchased any non-cancelable material and/or equipment that is not capable of use except in the performance of this Contract and has been specifically fabricated for the sole purpose of this Contract, but not yet incorporated into the Work, the Contractor shall be paid for such material and/or equipment in accordance with Article 64.2.1(b); provided, however, such payment is contingent upon the Contractor's delivery of such material and/or equipment in acceptable condition to a location designated by the City.

29.5 The Contractor agrees to make no claim for damages or for loss of overhead and profit with regard to any omitted Work.

ARTICLE 30. NOTICE AND DOCUMENTATION OF COSTS AND DAMAGES; PRODUCTION OF FINANCIAL RECORDS

30.1 If the Contractor shall claim to be sustaining damages by reason of any act or omission of the City or its agents, it shall submit to the Commissioner within forty-five (45) Days from the time such damages are first incurred, and every thirty (30) Days thereafter for as long as such damages are incurred, verified statements of the details and the amounts of such damages, together with documentary evidence of such damages. The Contractor may submit any of the above statements within such additional time as may be granted by the Commissioner in writing upon written request therefor. Failure of the Commissioner to respond in writing to a written request for additional time within thirty (30) Days shall be deemed a denial of the request. On failure of the Contractor to fully comply with the foregoing provisions, such claims shall be deemed waived and no right to recover on such claims shall exist. Damages that the Contractor may claim in any action or dispute resolution procedure arising under or by reason of this Contract shall not be different from or in excess of the statements and documentation made pursuant to this article.

30.2 In addition to the foregoing statements, the Contractor shall, upon notice from the Commissioner, produce for examination at the Contractor's office, by the Engineer, Architect or Project Manager, all of its books of account, bills, invoices, payrolls, subcontracts, time books, daily reports, bank deposit books, bank statements, check books, cancelled checks, showing all of its acts and transactions in connection with or relating to or arising by reason of this Contract, and submit itself and persons in its employment, for examination under oath by any person designated by the Commissioner or Comptroller to investigate claims made or disputes against the City under this Contract. At such examination, a duly authorized representative of the Contractor may be present.

30.3 In addition to the statements required under Article 28 and this Article, the Contractor and/or its Subcontractor shall, within thirty (30) Days upon notice from the Commissioner or Comptroller, produce for examination at the Contractor's and/or Subcontractor's office, by a representative of either the Commissioner or Comptroller, all of its books of account, bid documents, financial statements, accountant workpapers, bills, invoices, payrolls, subcontracts, time books, daily reports, bank deposit books, bank statements, check books, cancelled checks, showing all of its acts and transactions in connection with or relating to or arising by reason of this Contract. Further, the Contractor and/or its Subcontractor shall submit any person in its employment, for examination under oath by any person designated by the Commissioner or Comptroller to investigate claims made or disputes against the City under this Contract. At such examination, a duly authorized representative of the Contractor may be present.

30.4 Unless the information and examination required under Article 30.3 is provided by the Contractor and/or its Subcontractor upon thirty (30) Days notice from the Commissioner or Comptroller, or upon the Commissioner's or Comptroller's written authorization to extend the time to comply, the City shall be released

from all claims arising under, relating to or by reason of this Contract, except for sums certified by the Commissioner or Comptroller to be due under the provisions of this Contract. It is further stipulated and agreed that no person has the power to waive any of the foregoing provisions and that in any action or dispute resolution procedure against the City to recover any sum in excess of the sums certified by the Commissioner or Comptroller to be due under or by reason of this Contract, the Contractor must allege in its complaint and prove, at trial or during such dispute resolution procedure, compliance with the provisions of this Article.

30.5 In addition, after the commencement of any action or dispute resolution procedure by the Contractor arising under or by reason of this Contract, the City shall have the right to require the Contractor to produce for examination under oath, up until the trial of the action or hearing before the Contract Dispute Resolution Board, the books and documents described in Article 30.3 and submit itself and all persons in its employ for examination under oath. If this Article is not complied with as required, then the Contractor hereby consents to the dismissal of the action or dispute resolution procedure.

**CHAPTER VII
POWERS OF THE RESIDENT ENGINEER,
THE ENGINEER OR ARCHITECT AND THE COMMISSIONER**

ARTICLE 31. THE RESIDENT ENGINEER

31.1 The Resident Engineer shall have the power to inspect, supervise and control the performance of the Work, subject to review by the Commissioner. The Resident Engineer shall not, however, have the power to issue an Extra Work order, except as specifically designated in writing by the Commissioner.

ARTICLE 32. THE ENGINEER OR ARCHITECT OR PROJECT MANAGER

32.1 The Engineer or Architect or Project Manager, in addition to those matters elsewhere herein delegated to the Engineer and expressly made subject to his/her determination, direction or approval, shall have the power, subject to review by the Commissioner:

32.1.1 To determine the amount, quality, and location of the Work to be paid for hereunder; and

32.1.2 To determine all questions in relation to the Work, to interpret the Contract Drawings, Specifications, and Addenda, and to resolve all patent inconsistencies or ambiguities therein; and

32.1.3 To determine how the Work of this Contract shall be coordinated with Work of other Contractors engaged simultaneously on this Project, including the power to suspend any part of the Work, but not the whole thereof; and

32.1.4 To make minor changes in the Work as he/she deems necessary, provided such changes do not result in a net change in the cost to the City or to the Contractor of the Work to be done under the Contract; and

32.1.5 To amplify the Contract Drawings, add explanatory information and furnish additional Specifications and drawings, consistent with this Contract.

32.2 The foregoing enumeration shall not imply any limitation upon the power of the Engineer or Architect or Project Manager, for it is the intent of this Contract that all of the Work shall generally be subject to his/her determination, direction and approval, except where the determination, direction or approval of someone other than the Engineer or Architect or Project Manager is expressly called for herein.

32.3 The Engineer or Architect or Project Manager shall not, however, have the power to issue an Extra Work order, except as specifically designated in writing by the Commissioner.

ARTICLE 33. THE COMMISSIONER

33.1 The Commissioner, in addition to those matters elsewhere herein expressly made subject to his/her determination, direction or approval, shall have the power:

33.1.1 To review and make determinations on any and all questions in relation to this Contract and its performance; and

33.1.2 To modify or change this Contract so as to require the performance of Extra Work (subject, however, to the limitations specified in Article 25) or the omission of Contract Work; and

33.1.3 To suspend the whole or any part of the Work whenever in his/her judgment such suspension is required:

33.1.3(a) In the interest of the City generally; or

33.1.3(b) To coordinate the Work of the various Contractors engaged on this Project to the provisions of Article 12; or

33.1.3(c) To expedite the completion of the entire Project even though the completion of this particular Contract may thereby be delayed.

ARTICLE 34. NO ESTOPPEL

34.1 Neither the City nor any Agency, officer, agent or employee thereof, shall be bound, precluded or estopped by any determination, decision, approval, order, letter, payment or certificate made or given under or in connection with this Contract by the City, the Commissioner, the Resident Engineer, or any other officer, agent or employee of the City, either before or after the final completion and acceptance of the Work and payment therefor:

34.1.1 From showing the true and correct classification, amount, quality or character of the Work actually done; or that any such determination, decision, order, letter, payment or certificate was untrue, incorrect or improperly made in any particular, or that the Work, or any part thereof, does not in fact conform to the requirements of this Contract; and

34.1.2 From demanding and recovering from the Contractor any overpayment made to it, or such damages as the City may sustain by reason of the Contractor's failure to perform each and every part of its Contract.

CHAPTER VIII LABOR PROVISIONS

ARTICLE 35. EMPLOYEES

35.1 The Contractor and its Subcontractors shall not employ on the Work:

35.1.1 Anyone who is not competent, faithful and skilled in the Work for which he/she shall be employed; and whenever the Commissioner shall inform the Contractor, in writing, that any employee is, in his/her opinion, incompetent, unfaithful or disobedient, that

employee shall be discharged from the Work forthwith, and shall not again be employed upon it; or

35.1.2 Any labor, materials or means whose employment, or utilization during the course of this Contract, may tend to or in any way cause or result in strikes, work stoppages, delays, suspension of Work or similar troubles by workers employed by the Contractor or its Subcontractors, or by any of the trades working in or about the buildings and premises where Work is being performed under this Contract, or by Other Contractors or their Subcontractors pursuant to other Contracts, or on any other building or premises owned or operated by the City, its Agencies, departments, boards or authorities. Any violation by the Contractor of this requirement may, upon certification of the Commissioner, be considered as proper and sufficient cause for declaring the Contractor to be in default, and for the City to take action against it as set forth in Chapter X of this Contract, or such other article of this Contract as the Commissioner may deem proper; or

35.1.3 In accordance with Section 220.3-e of the Labor Law of the State of New York (hereinafter "Labor Law"), the Contractor and its Subcontractors shall not employ on the Work any apprentice, unless he/she is a registered individual, under a bona fide program registered with the New York State Department of Labor. The allowable ratio of apprentices to journey-level workers in any craft classification shall not be greater than the ratio permitted to the Contractor as to its Work force on any job under the registered program. Any employee listed on a payroll at an apprentice wage rate, who is not registered as above, shall be paid the wage rate determined by the Comptroller of the City for the classification of Work actually performed. The Contractor or Subcontractor will be required to furnish written evidence of the registration of its program and apprentices as well as all the appropriate ratios and wage rates, for the area of the construction prior to using any apprentices on the Contract Work.

35.2 If the total cost of the Work under this Contract is at least two hundred fifty thousand dollars, all laborers, workers, and mechanics employed in the performance of the Contract on the public work site, either by the Contractor, Subcontractor or other person doing or contracting to do the whole or a part of the work contemplated by the contract, shall be certified prior to performing any Work as having successfully completed a course in construction safety and health approved by the United States department of labor's occupational safety and health administration that is at least ten hours in duration.

ARTICLE 36. NO DISCRIMINATION

36.1 The Contractor specifically agrees, as required by Labor Law Section 220-e, as amended, that:

36.1.1 In the hiring of employees for the performance of Work under this Contract or any subcontract hereunder, neither the Contractor, Subcontractor, nor any person acting on behalf of such Contractor or Subcontractor, shall by reason of race, creed, color or national origin discriminate against any citizen of the State of New York who is qualified and available to perform the Work to which the employment relates;

36.1.2 Neither the Contractor, Subcontractor, nor any person on its behalf shall, in any manner, discriminate against or intimidate any employee hired for the performance of work under this Contract on account of race, creed, color or national origin;

36.1.3 There may be deducted from the amount payable to the Contractor by the City under this Contract a penalty of fifty (\$50.00) dollars for each person for each Day during which such person was discriminated against or intimidated in violation of the provisions of this Contract; and

36.1.4 This Contract may be cancelled or terminated by the City and all moneys due or to become due hereunder may be forfeited, for a second or any subsequent violation of the terms or conditions of this article.

36.1.5 The aforesaid provisions of this article covering every Contract for or on behalf of the State or a municipality for the manufacture, sale or distribution of materials, equipment or supplies shall be limited to operations performed within the territorial limits of the State of New York.

36.2 The Contractor specifically agrees, as required by Section 6-108 of the Administrative Code, as amended, that:

36.2.1 It shall be unlawful for any person engaged in the construction, alteration or repair of buildings or engaged in the construction or repair of streets or highways pursuant to a Contract with the City or engaged in the manufacture, sale or distribution of materials, equipment or supplies pursuant to a Contract with the City to refuse to employ or to refuse to continue in any employment any person on account of the race, color or creed of such person.

36.2.2 It shall be unlawful for any person or any servant, agent or employee of any person, described in Article 36.1.2, to ask, indicate or transmit, orally or in writing, directly or indirectly, the race, color or creed or religious affiliation of any person employed or seeking employment from such person, firm or corporation.

36.2.3 Breach of the foregoing provisions shall be deemed a violation of a material provision of this Contract.

36.2.4 Any person, or the employee, manager or owner of or officer of such firm or corporation who shall violate any of the provisions of this section shall, upon conviction thereof, be punished by a fine of not more than one hundred (\$100.00) dollars or by imprisonment for not more than thirty (30) Days, or both.

36.3 This Contract is subject to the requirements of Executive Order No. 50 (1980) ("E.O. 50"), as revised, and the Rules and Regulations promulgated thereunder. No Contract will be awarded unless and until these requirements have been complied with in their entirety. By signing this Contract, the Contractor agrees that it:

36.3.1 Will not engage in any unlawful discrimination against any employee or applicant for employment because of race, creed, color, national origin, sex, age, disability, marital status or sexual orientation with respect to all employment decisions including, but not limited to, recruitment, hiring, upgrading, demotion, downgrading, transfer, training, rates of pay or other forms of compensation, layoff, termination, and all other terms and conditions of employment; and

36.3.2 Will not engage in any unlawful discrimination in the selection of Subcontractors on the basis of the owner's race, color, creed, national origin, sex, age, disability, marital status or sexual orientation; and

36.3.3 Will state in all solicitations or advertisements for employees placed by or on behalf of the Contractor that all qualified applicants will receive consideration for employment without unlawful discrimination based on race, creed, color, national origin, sex, age, citizens status, disability, marital status, sexual orientation, or that it is an equal employment opportunity employer; and

36.3.4 Will send to each labor organization or representative of workers with which it has a Collective Bargaining Agreement or other Contract or memorandum of understanding, written

notification of its equal employment opportunity commitments under E.O. 50 and the Rules and Regulations promulgated thereunder; and

36.3.5 Will furnish all information and reports including an Employment Report before the award of the **Contract** which are required by E.O. 50, the Rules and Regulations promulgated thereunder, and orders of the Department of Business Services, Division of Labor Services ("**DLS**") and will permit access to its books, records and accounts by the **DLS** for the purposes of investigation to ascertain compliance with such rules, regulations, and orders.

36.4 The **Contractor** understands that in the event of its noncompliance with the nondiscrimination clauses of this **Contract** or with any of such rules, regulations, or orders, such noncompliance shall constitute a material breach of this **Contract** and noncompliance with E.O. 50 and the Rules and Regulations promulgated thereunder. After a hearing held pursuant to the rules of the **DLS**, the Director of the **DLS** may direct the **Commissioner** to impose any or all of the following sanctions:

36.4.1 Disapproval of the **Contractor**; and/or

36.4.2 Suspension or termination of the **Contract**; and/or

36.4.3 Declaring the **Contractor** in default; and/or

36.4.4 In lieu of any of the foregoing sanctions, the Director of the **DLS** may impose an employment program.

Failure to comply with E.O. 50 and the rules and regulations promulgated thereunder, in one or more instances, may result in the **Agency** declaring the **Contractor** to be non-responsible.

The **Contractor** further agrees that it will refrain from entering into any **Contract** or **Contract** modification subject to E.O. 50 and the rules and regulations promulgated thereunder with a **Subcontractor** who is not in compliance with the requirements of E.O. 50 and the rules and regulations promulgated thereunder.

36.5 The **Contractor** specifically agrees, as required by Section 6-123 of the Administrative Code, that:

36.5.1 The **Contractor** will not engage in any unlawful discriminatory practice in violation of Title VIII of the Administrative Code;

36.5.2 every agreement between the **Contractor** and its **Subcontractors** in excess of \$50,000 shall include a provision that the **Subcontractor** shall not engage in any unlawful discriminatory practice as defined in title viii of the Administrative Code (Section 8-101 et. seq.); and

36.5.3 Any failure to comply with this Article 36.5 may subject the **Contractor** to the remedies set forth in Section 6-123 of the Administrative Code, including, where appropriate, sanctions such as withholding of payment, imposition of an employment program, finding the **Contractor** to be in default, cancellation of the **Contract**, or any other sanction or remedy provided by Law or **Contract**.

ARTICLE 37. LABOR LAW REQUIREMENTS

37.1 The **Contractor** shall strictly comply with all applicable provisions of the Labor Law, as amended. Such compliance is a material term of this **Contract**.

37.2 The Contractor specifically agrees, as required by Labor Law Section 220 and 220-d, as amended, that:

37.2.1 **Hours of Work:** No laborer, worker, or mechanic in the employ of the Contractor, Subcontractor or other person doing or contracting to do the whole or a part of the Work contemplated by this Contract shall be permitted or required to work more than eight (8) hours in any one (1) calendar Day, or more than five (5) Days in any one (1) week, except as provided in the Labor Law and in cases of extraordinary emergency including fire, flood, or danger to life or property, or in the case of national emergency when so proclaimed by the President of the United States of America.

37.2.2 In situations in which there are not sufficient laborers, workers and mechanics who may be employed to carry on expeditiously the Work contemplated by this Contract as a result of such restrictions upon the number of hours and days of labor, and the immediate commencement or prosecution or completion without undue delay of the Work is necessary for the preservation of the Site and/or for the protection of the life and limb of the persons using the same, such laborers, workers, and mechanics shall be permitted or required to work more than eight (8) hours in any one (1) Day; or five (5) Days in any one (1) week; provided, however, that upon application of any Contractor, the Commissioner shall have first certified to the Commissioner of Labor of the State of New York (hereinafter "Commissioner of Labor") that such public Work is of an important nature and that a delay in carrying it to completion would result in serious disadvantage to the public; and provided, further, that such Commissioner of Labor shall have determined that such an emergency does in fact exist as provided in Labor Law Section 220.2.

37.2.3 Failure of the Commissioner to make such a certification to the Commissioner of Labor shall not entitle the Contractor to damages for delay or for any cause whatsoever.

37.2.4 **Prevailing Rate of Wages:** The wages to be paid for a legal day's Work to laborers, workers, or mechanics employed upon the Work contemplated by this Contract or upon any materials to be used thereon shall not be less than the "prevailing rate of wage" as defined in Labor Law Section 220, and as fixed by the Comptroller in the attached Schedule of Wage Rates and in updated schedules thereof. The prevailing wage rates and supplemental benefits to be paid are those in effect at the time the Work is being performed.

37.2.5 Requests for interpretation or correction in the Information for Bidders includes all requests for clarification of the classification of trades to be employed in the performance of the Work under this Contract. In the event that a trade not listed in the Contract is in fact employed during the performance of this Contract, the Contractor shall be required to obtain from the Agency the prevailing wage rates and supplementary benefits for the trades used and to complete the performance of this Contract at the price at which the Contract was awarded.

37.2.6 **Minimum Wages:** Except for employees whose wage is required to be fixed pursuant to Labor Law Section 220, all persons employed by the Contractor and any Subcontractor in the manufacture or furnishing of the supplies, materials, or equipment, or the furnishing of work, labor, or services, used in the performance of this Contract, shall be paid, without subsequent deduction or rebate unless expressly authorized by Law, not less than the sum mandated by Law. Minimum wages shall be the rates fixed by Federal Law and regulations.

37.3 **Working Conditions:** No part of the Work, labor or services shall be performed or rendered by the Contractor in any plants, factories, buildings or surroundings or under working conditions which are unsanitary or hazardous or dangerous to the health and safety of employees engaged in the performance of this Contract. Compliance with the safety, sanitary and factory inspection Laws of the state in which the Work is to be performed shall be prima facie evidence of compliance with this article.

37.4 Prevailing Wage Enforcement: The Contractor agrees to pay for all costs incurred by the City in enforcing prevailing wage requirements, including the cost of any investigation conducted by or on behalf of the Agency or the Comptroller, where the City discovers a failure to comply with any of the requirements of this Article 37 by the Contractor or its Subcontractor(s). The Contractor also agrees, that should it fail or refuse to pay for any such investigation, the Agency is hereby authorized to deduct from a Contractor's account an amount equal to the cost of such investigation.

37.4.1 The Labor Law Section 220 and Section 220-d, as amended, provide that this Contract shall be forfeited and no sum paid for any Work done hereunder on a second conviction for willfully paying less than:

37.4.1(a) The stipulated wage scale as provided in Labor Law Section 220, as amended, or

37.4.1(b) Less than the stipulated minimum hourly wage scale as provided in Labor Law Section 220-d, as amended.

37.4.2 For any breach or violation of either Working Conditions (Article 37.3) and Minimum Wages (Article 37.2.6), the party responsible therefore shall be liable to the City for liquidated damages, which may be withheld from any amounts due on any Contracts with the City of such party responsible, or may be recovered in suits brought by the Corporation Counsel in the name of the City, in addition to damage for any other breach of this Contract, a sum equal to the amount of any underpayment of wages due to any employee engaged in the performance of this Contract. In addition, the Commissioner shall have the right to cancel Contracts and enter into other Contracts for the completion of the original Contract, with or without public letting, and the original Contractor shall be liable for any additional cost. All sums withheld or recovered as deductions, rebates, refunds, or underpayment of wages hereunder, shall be held in a special deposit account and shall be paid without interest, on order of the Comptroller, directly to the employees who have been paid less than minimum rates of pay as set forth herein and on whose account such sums were withheld or recovered, provided that no claims by employees for such payments shall be entertained unless made within two (2) years from the date of actual notice to the Contractor of the withholding or recovery of such sums by the City.

37.4.3 A determination by the Comptroller that a Contractor and/or its Subcontractor willfully violated Labor Law Section 220 will be forwarded to the City's five District Attorneys for review.

37.4.4 The Contractor's or Subcontractor's noncompliance with this article and Labor Law Section 220, may result in an unsatisfactory performance evaluation and the Comptroller may also find and determine that the Contractor or Subcontractor willfully violated the New York Labor Law.

37.4.4(a) An unsatisfactory performance evaluation for noncompliance with this article may result in a determination that the Contractor is a non-responsible bidder on subsequent procurements with the City and thus a rejection of a future award of a contract with the City, as well as any other sanctions provided for by Law.

37.4.4(b) Labor Law Section 220-b, as amended, provides that when two (2) final determinations have been rendered against a Contractor or Subcontractor within any consecutive six (6) year period determining that such Contractor or Subcontractor has willfully failed to pay the prevailing rate of wages or to provide supplements in accordance with the Labor Law and this article, whether such failures were concurrent or consecutive and whether or not such final determinations concerning separate public work projects are rendered

simultaneously, such **Contractor** or **Subcontractor** shall be ineligible to submit a bid on or be awarded any public work contract with the **City** for a period of five (5) years from the second final determination. If the final determination involves the falsification of payroll records or the kickback of wages or supplements, the **Contractor** or **Subcontractor** shall be ineligible to submit a bid on or be awarded any public work contract with the **City** for a period of five (5) years from the first final determination.

37.4.4(c) Labor Law Section 220, as amended, provides that the **Contractor** or **Subcontractor** found to have violated this article may be directed to make payment of wages or supplements including interest found to be due, and the **Contractor** or **Subcontractor** may be directed to make payment of a further sum as a civil penalty in an amount not exceeding twenty-five (25%) percent of the total amount found to be due.

37.5 The **Contractor** and its **Subcontractors** shall within ten (10) **Days** after mailing of a Notice of Award or written order, post in prominent and conspicuous places in each and every plant, factory, building, and structure where employees of the **Contractor** and its **Subcontractors** engaged in the performance of this **Contract** are employed, notices furnished by the **City**, in relation to prevailing wages and supplements, minimum wages and other stipulations contained in Sections 220 and 220-h of the Labor Law, and the **Contractor** and its **Subcontractors** shall continue to keep such notices posted in such prominent and conspicuous places until **Final Acceptance** of the supplies, materials, equipment, or **Work**, labor, or services required to be furnished or rendered under this **Contract**.

37.6 The **Contractor** shall strictly comply with all of the provisions of Articles 37.6.1 through 37.6.5, and provide for all workers, laborers or mechanics in its employ, the following:

37.6.1 **Notices Posted At Site:** Post, in a location designated by the **City**, schedules of prevailing wages and supplements for this **Project**, a copy of all re-determinations of such schedules for the **Project**, the **Workers' Compensation Law** Section 51 notice, all other notices required by law to be posted at the **Site**, the **City** notice that this **Project** is a public works **Project** on which each worker is entitled to receive the prevailing wages and supplements for the occupation at which he or she is working, and all other notices which the **City** directs the **Contractor** to post. The **Contractor** shall provide a surface for such notices which is satisfactory to the **City**. The **Contractor** shall maintain and keep current such notices in a legible manner and shall replace any notice or schedule which is damaged, defaced, illegible or removed for any reason. The **Contractor** shall post such notices before commencing any **Work** on the **Site** and shall maintain such notices until all **Work** on the **Site** is complete; and

37.6.2 **Daily Site Sign-in Sheets:** Maintain daily **Site** sign-in sheets, and require that **Subcontractors** maintain daily **Site** sign-in sheets for its employees, which include blank spaces for an employee's name to be both printed and signed, job title, date started and **Social Security** number, the time the employee began **Work** and the time the employee left **Work**, until **Final Acceptance** of the supplies, materials, equipment, or **Work**, labor, or services to be furnished or rendered under this **Contract** unless exception is granted by the **Comptroller** upon application by the **Agency**. In the alternative, subject to the approval of the **CCPO**, the **Contractor** and **Subcontractor** may maintain an electronic or biometric sign-in system, which provides the information required by this Article 37.6.2; and

37.6.3 **Individual Employee Information Notices:** Distribute a notice, to each worker, laborer or mechanic employed under this **Contract**, in a form provided by the **Agency**, that this **Project** is a public work project on which each worker, laborer or mechanic is entitled to receive the prevailing rate of wages and supplements for the occupation at which he or she is working. If the total cost of the **Work** under this **Contract** is at least two hundred fifty thousand dollars, such notice shall also include a statement that, that each worker, laborer or mechanic be certified prior to performing any

Work as having successfully completed a course in construction safety and health approved by the United States department of labor's occupational safety and health administration that is at least ten hours in duration. Such notice shall be distributed to each worker before he or she starts performing any Work of this Contract and with the first paycheck after July first of each year. Worker, laborer or mechanic includes employees of the Contractor and all Subcontractors and all employees of suppliers entering the Site. At the time of distribution, the Contractor shall have each worker, laborer or mechanic sign a statement, in a form provided by the Agency, certifying that the worker has received the notice required by this article, which signed statement shall be maintained with the payroll records required by this Contract; and

37.6.3.1 The Contractor and each Subcontractor shall notify each worker, laborer or mechanic employed under this Contract in writing of the prevailing rate of wages for their particular job classification. Such notification shall be given to every worker, laborer and mechanic on their first pay stub and with every pay stub thereafter; and

37.6.4 Site Laminated Identification Badges: Provide laminated identification badges which indicate the worker's, laborer's or mechanic's name, trade, employer's name and employment starting date (month/day/year). Further, require as a condition of employment on the Site, that each and every worker, laborer or mechanic wear the laminated identification badge at all times and that it may be seen by any representative of the City; and

37.6.5 Language Other Than English Used On Site: Provide the ACCO notice when three (3) or more employees (worker and/or laborer and/or mechanic) on the Site, at any time, speak a language other than English. The ACCO will then provide the Contractor the notices in Article 37.6.1 in that language or languages as may be required. The Contractor is responsible for all distributions under Article 37; and

37.6.6 Provision of Records: The Contractor and Subcontractor(s) shall produce within five (5) Days on the Site of the Work and upon a written order of the Engineer, the Commissioner, the ACCO, the Agency EAO, or the Comptroller, such records as are required to be kept by this Article 37.6; and

37.6.7 If this Contract is for an amount greater than \$1,000,000, checks issued by the Contractor to covered employees shall be generated by a payroll service or automated payroll system (an in-house system may be used if approved by the Agency). For any subcontract for an amount greater than \$750,000, checks issued by a Subcontractor to covered employees shall be generated by a payroll service or automated payroll system (an in-house system may be used if approved by the Agency); and

37.6.8 The failure of the Contractor or Subcontractor(s) to comply with the provisions of Articles 37.6.1 through 37.6.7 may result in the Commissioner declaring the Contractor or Subcontractor(s) in default and/or the withholding of payments otherwise due under the Contract.

37.7 The Contractor and its Subcontractors shall keep such employment and payroll records as are required by Section 220 of the Labor Law.

37.8 At the time the Contractor makes application for each partial payment and for final payment, the Contractor shall submit to the Commissioner a written payroll certification, in the form provided by this Contract, of compliance with the prevailing wage, minimum wage and other provisions and stipulations required by Labor Law Section 220 and of compliance with the training requirements of Labor law section 220-h set forth in Article 35.2. This certification of compliance with the provisions of this article shall be a condition precedent to payment and no payment shall be made to the Contractor unless and until each such certification shall have been submitted to and received by the Commissioner.

37.9 This Contract is executed by the Contractor with the express warranty and representation that the Contractor is not disqualified under the provisions of Section 220 of the Labor Law for the award of the Contract.

37.10 Any breach or violation of any of the foregoing shall be deemed a breach or violation of a material provision of this Contract, and grounds for cancellation thereof by the City.

ARTICLE 38. PAYROLL REPORTS

38.1 The Contractor shall maintain on the Site the original payrolls or transcripts thereof which the Contractor and its Subcontractor(s) are required to maintain pursuant to Labor Law Section 220. The Contractor and Subcontractor(s) shall submit original payrolls or transcripts, subscribed and affirmed by it as true, with each and every payment requisition. The Contractor and Subcontractor(s) shall produce within five (5) Days on the Site of the Work and upon a written order of the Engineer, the Commissioner, the ACCO, the Agency EAO, or the Comptroller, such original payrolls or transcripts thereof, subscribed and affirmed by it as true, and the statements signed by each worker pursuant to this Chapter VIII. In addition, the Contractor and Subcontractor(s) shall furnish to the Engineer upon written demand any other information to satisfy the Engineer that this Chapter VIII and the Labor Law, as to the hours of employment and rates of wages, are being observed. The Contractor shall maintain the payrolls or transcripts thereof for six (6) years from the date of completion of the Work on this Contract.

38.2 When directed by the Engineer, the Contractor or Subcontractor shall provide the Engineer with an attendance sheet for each Day on which Work is performed on the Site. Such attendance sheet shall be in a form acceptable to the Agency and shall provide information for employees of the Contractor and Subcontractor(s).

ARTICLE 39. DUST HAZARDS

39.1 Should a harmful dust hazard be created in performing the Work of this Contract, for the elimination of which appliances or methods have been approved by the Board of Standards and Appeals of the City of New York, such appliances and methods shall be installed, maintained, and effectively operated during the continuance of such harmful dust hazard. Failure to comply with this provision after notice shall make this Contract void.

CHAPTER IX PARTIAL AND FINAL PAYMENTS

ARTICLE 40. CONTRACT PRICE

40.1 The City shall pay, and the Contractor agrees to accept, in full consideration for the Contractor's performance of the Work subject to the terms and conditions hereof, the lump sum price or unit prices which this Contract was awarded, plus the amount required to be paid for any Extra Work ordered by the Commissioner under Article 25, less credit for any Work omitted pursuant to Article 29.

ARTICLE 41. BID BREAKDOWN ON LUMP SUM

41.1 Within fifteen (15) Days after the commencement date specified in the Notice to Proceed, unless otherwise directed by the Resident Engineer, the Contractor shall submit to the Resident Engineer a breakdown of its bid price, or of lump sums bid for items of the Contract, showing the various operations to be performed

under the **Contract**, as directed in the progress schedule required under Article 9, and the value of each of such operations, the total of such items to equal the lump sum price bid. Said breakdown must be approved in writing by the **Resident Engineer**.

41.2 No partial payment will be approved until the **Contractor** submits a bid breakdown that is acceptable to the **Resident Engineer**.

41.3 The **Contractor** shall also submit such other information relating to the bid breakdown as directed by the **Resident Engineer**. Thereafter, the breakdown may be used only for checking the **Contractor's** applications for partial payments hereunder, but shall not be binding upon the **City**, the **Commissioner**, or the **Engineer** for any purpose whatsoever.

ARTICLE 42. PARTIAL PAYMENTS

42.1 From time to time as the **Work** progresses satisfactorily, but not more often than once a month, the **Contractor** may submit to the **Engineer** a requisition for a partial payment in the prescribed form, which shall contain an estimate of the quantity and the fair value of the **Work** done during the payment period.

42.2 Partial payments may be made for materials, fixtures and equipment in advance of their actual incorporation in the **Work**, as the **Commissioner** may approve, and upon the terms and conditions set forth in the **General Conditions**.

42.3 The **Contractor** shall also submit to the **Commissioner** in connection with every application for partial payment a verified statement in the form prescribed by the **Comptroller** setting forth the information required under Labor Law Section 220-a.

42.4 Within thirty (30) **Days** after receipt of such satisfactory payment application, the **Engineer** will prepare and certify, and the **Commissioner** will approve, a voucher for a partial payment in the amount of such approved estimate, less any and all deductions authorized to be made by the **Commissioner** under the terms of this **Contract** or by **Law**.

ARTICLE 43. PROMPT PAYMENT

43.1 The Prompt Payment provisions of the **PPB Rules** in effect at the time of the **Bid** will be applicable to payments made under this **Contract**. The provisions require the payment to **Contractor** of interest on payments made after the required payment date, except as set forth in the **PPB Rules**.

43.2 The **Contractor** shall submit a proper invoice to receive payment, except where the **Contract** provides that the **Contractor** will be paid at predetermined intervals without having to submit an invoice for each scheduled payment.

43.3 Determination of interest due will be made in accordance with the **PPB Rules**.

43.4 If the **Contractor** is paid interest, the proportionate share of that interest shall be forwarded by the **Contractor** to its **Subcontractor(s)**.

43.5 The **Contractor** shall pay each **Subcontractor** or **Materialman** not later than seven (7) **Days** after receipt of payment out of amounts paid to the **Contractor** by the **City** for **Work** performed by the **Subcontractor** or **Materialman** under this **Contract**.

43.5.1 If Contractor fails to make any payment to any Subcontractor or Materialman within seven (7) days after receipt of payment by the City pursuant to section 43.5 herein, then the Contractor shall pay interest on amounts due to such Subcontractor or Materialman at a rate of interest in effect on the date such payment is made by the Contractor computed in accordance with section 756-b (1)(b) of the NY General Business Law. Accrual of interest shall commence on the day immediately following the expiration of the seventh day following receipt of payment to the Contractor by the City and shall end on the date on which payment is made.

43.6 The Contractor shall include in each of its subcontracts a provision requiring each Subcontractor to make payment to each of its Subcontractors or suppliers for Work performed under this Contract in the same manner and within the same time period set forth above.

ARTICLE 44. SUBSTANTIAL COMPLETION PAYMENT

44.1 When the Work in the opinion of the Commissioner, has been substantially but not entirely completed, he/she shall issue a certificate of Substantial Completion.

44.2 The Contractor shall submit with the Substantial Completion requisition:

44.2.1 A Final Verified Statement of any and all alleged claims against the City and any pending dispute resolution procedures in accord with the PPB Rules and this Contract, in any way connected with or arising out of this Contract (including those as to which details may have been furnished pursuant to Articles 11, 27, 28, and 30) setting forth with respect to each such claim the total amount thereof, the various items of labor and materials included therein, and the alleged value of each item; and if the alleged claim be one for delay, the alleged cause of each such delay, the period or periods of time, giving the dates when the Contractor claims the performance of the Work or a particular part thereof was delayed, and an itemized statement and breakdown of the amount claimed for each such delay.

44.2.1(a) With respect to each such claim, the Commissioner, the Comptroller and, in the event of litigation, the Corporation Counsel of the City shall have the same right to inspect, and to make extracts or copies of, the Contractor's books, vouchers, records, etc., as is referred to in Articles 11, 27, 28, and 30. Nothing contained in this article is intended to or shall relieve the Contractor from the obligation of complying strictly with Articles 11, 27, 28, and 30. The Contractor is warned that unless such claims are completely set forth as herein required, the Contractor upon acceptance of the Substantial Completion payment pursuant to this article, will have waived any such claims.

44.2.2 A Final Approved Punch List.

44.2.3 Where required, a request for a substantial or final extension of time.

44.3 The Commissioner shall issue a voucher calling for payment of any part or all of the balance due for Work performed under the Contract, including monies retained under Article 21, less any and all deductions authorized to be made by the Commissioner, under this Contract or by Law, and less twice the amount the Commissioner considers necessary to ensure the completion of the balance of the Work by the Contractor. Such a payment shall be considered a Partial and not a Final Payment. No Substantial Completion payment shall be made under this article where the Contractor shall fail to complete the Work within the time fixed for such completion in the Schedule A of the General Conditions, or within the time to which completion may have been extended, until an extension or extensions of time for the completion of Work have been acted upon pursuant to Article 13.

44.4 No further partial payments shall be made to the Contractor after the Commissioner issues a Certificate of Substantial Completion, except the Substantial Completion payment and Contractor's requisition that were properly filed with the Commissioner prior to the date of Substantial Completion; however, the Commissioner may grant a waiver for further partial payments after the date of Substantial Completion to permit payments for change order Work and/or release of retainage and deposits pursuant to Articles 21 and 24. Such waiver shall be in writing.

44.5 The Contractor acknowledges that nothing contained in this article is intended to or shall in any way diminish the force and effect of Article 13.

ARTICLE 45. FINAL PAYMENT

45.1 After completion and Final Acceptance of the Work, the Contractor shall submit all required certificates and documents, together with a requisition for the balance claimed to be due under the Contract, less the amount authorized to be retained for maintenance under Article 24. A verified statement similar to that required in connection with applications for partial payments shall also be submitted to the Commissioner.

45.2 Amended Verified Statement of Claims: The Contractor shall also submit with the final requisition any amendments to the final verified statement of any and all alleged claims against the City, and any pending dispute resolution procedures in accord with the PPB Rules and this Contract, in any way connected with or arising out of this Contract (including those as to which details may have been furnished pursuant to Articles 11, 27, 28, and 30.) that have occurred subsequent to Substantial Completion, setting forth with respect to each such claim the total amount thereof, the various items of labor and materials included therein, and the alleged value of each such item; and if the alleged claim be one for delay, the alleged cause of each such delay, the period or periods of time, giving the dates when the Contractor claims the performance of the Work or a particular part thereof was delayed, and an itemized statement and breakdown of the amount claimed for each such delay. With reference to each such claim, the Commissioner, the Comptroller and, in the event of litigation, the Corporation Counsel of the City shall have the same right to inspect, and to make extracts or copies of, the Contractor's books, vouchers, records, etc., as is referred to in Articles 11, 27, 28, and 30. Nothing contained in this article, is entitled to or shall relieve the Contractor from the obligation of complying strictly with Articles 11, 27, 28, and 30. The Contractor is warned that unless such claims are completely set forth as herein required, the Contractor, upon acceptance of the Final Payment pursuant to Article 46, will have waived any such claims.

45.3 Preparation of Final Voucher: Upon determining the balance due hereunder other than on account of claims, the Engineer will prepare and certify, for the Commissioner's approval, a voucher for final payment in that amount less any and all deductions authorized to be made by the Commissioner under this Contract or by Law. In the case of a lump sum Contract, the Commissioner shall certify the voucher for final payment within thirty (30) Days from the date of completion and acceptance of the Work, provided all requests for extensions of time have been acted upon.

45.3.1 All prior certificates and vouchers upon which partial payments were made, being merely estimates made to enable the Contractor to prosecute the Work more advantageously, shall be subject to correction in the final voucher, and the certification of the Engineer thereon and the approval of the Commissioner thereof, shall be conditions precedent to the right of the Contractor to receive any money hereunder. Such final voucher shall be binding and conclusive upon the Contractor.

45.3.2 Payment pursuant to such final voucher, less any deductions authorized to be made by the Commissioner under this Contract or by Law, shall constitute the final payment, and shall be made by the Comptroller within thirty (30) Days after the filing of such voucher in his/her office.

45.4 The Contractor acknowledges that nothing contained in this article is intended to or shall in any way diminish the force and effect of Article 13.

ARTICLE 46. ACCEPTANCE OF FINAL PAYMENT

46.1 The acceptance by the Contractor, or by anyone claiming by or through it, of the final payment, whether such payment be made pursuant to any judgment of any Court, or otherwise, shall constitute and operate as a release to the City from any and all claims of and liability to the Contractor for anything heretofore done or furnished for the Contractor relating to or arising out of this Contract and the Work done hereunder, and for any prior act, neglect or default on the part of the City or any of its officers, agents or employees, excepting only a claim against the City for the amounts deducted or retained in accordance with the terms and provisions of this Contract or by Law, and excepting any claims, not otherwise waived, or any pending dispute resolution procedures which are contained in the verified statement filed with the Contractor's substantial and final requisitions pursuant to Articles 44 and 45.

46.2 The Contractor is warned that the execution by it of a release, in connection with the acceptance of the final payment, containing language purporting to reserve claims other than those herein specifically excepted from the operation of this article, or those for amounts deducted by the Commissioner from the final requisition or by the Comptroller from the final payment as certified by the Engineer and approved by the Commissioner, shall not be effective to reserve such claims, anything stated to the Contractor orally or in writing by any officer, agent or employee of the City to the contrary notwithstanding.

46.3 Should the Contractor refuse to accept the final payment as tendered by the Comptroller, it shall constitute a waiver of any right to interest thereon.

46.4 The Contractor, however, shall not be barred from commencing an action for breach of Contract under this provision to the extent permitted by Law and by the terms of the Contract provided that a detailed and verified statement of claim is served upon the contracting Agency and Comptroller not later than forty (40) Days after the mailing of such final payment. The statement shall specify the items upon which the claim will be based and any such claim shall be limited to such items.

ARTICLE 47. APPROVAL BY PUBLIC DESIGN COMMISSION

47.1 All works of art, including paintings, mural decorations, stained glass, statues, bas-reliefs and other sculptures, monuments, fountains, arches, and other structures of a permanent character intended for ornament or commemoration, and every design of the same to be used in the performance of this Contract, and the design of all bridges, approaches, buildings, gates, fences, lamps, or structures to be erected, pursuant to the terms of this Contract, shall be submitted to the Art Commission, d/b/a the Public Design Commission of the City of New York, and shall be approved by the Public Design Commission prior to the erection or placing in the position of the same. The final payment shall not become due or payable under this Contract unless and until the Public Design Commission shall certify that the design for the Work herein contracted for has been approved by the said Public Design Commission, and that the same has been executed in substantial accordance with the design so approved, pursuant to the provisions of Chapter 37, Section 854 of the City Charter, as amended.

**CHAPTER X
CONTRACTOR'S DEFAULT**

ARTICLE 48. COMMISSIONER'S RIGHT TO DECLARE CONTRACTOR IN DEFAULT

48.1 In addition to those instances specifically referred to in other Articles herein, the Commissioner shall have the right to declare the Contractor in default of this Contract if:

48.1.1 The Contractor fails to commence Work when notified to do so by the Commissioner; or if

48.1.2 The Contractor shall abandon the Work; or if

48.1.3 The Contractor shall refuse to proceed with the Work when and as directed by the Commissioner; or if

48.1.4 The Contractor shall, without just cause, reduce its working force to a number which, if maintained, would be insufficient, in the opinion of the Commissioner, to complete the Work in accordance with the Progress Schedule; or if

48.1.5 The Contractor shall fail or refuse to increase sufficiently such working force when ordered to do so by the Commissioner; or if

48.1.6 The Contractor shall sublet, assign, transfer, convert or otherwise dispose of this Contract other than as herein specified; or sell or assign a majority interest in the Contractor; or if

48.1.7 The Contractor fails to secure and maintain all required insurance; or if

48.1.8 A receiver or receivers are appointed to take charge of the Contractor's property or affairs; or if

48.1.9 The Commissioner shall be of the opinion that the Contractor is or has been unnecessarily or unreasonably or willfully delaying the performance and completion of the Work, or the award of necessary subcontracts, or the placing of necessary material and equipment orders; or if

48.1.10 The Commissioner shall be of the opinion that the Contractor is or has been willfully or in bad faith violating any of the provisions of this Contract; or if

48.1.11 The Commissioner shall be of the opinion that the Work cannot be completed within the time herein provided therefor or within the time to which such completion may have been extended; provided, however, that the impossibility of timely completion is, in the Commissioner's opinion, attributable to conditions within the Contractor's control; or if

48.1.12 The Work is not completed within the time herein provided therefor or within the time to which the Contractor may be entitled to have such completion extended; or if

48.1.13 Any statement or representation of the Contractor in the Contract or in any document submitted by the Contractor with respect to the Work, the Project, or the Contract (or for purposes of securing the Contract) was untrue or incorrect when made.

48.1.14 The Contractor or any of its officers, directors, partners, five (5%) percent shareholders, principals, or other persons substantially involved in its activities, commits any of the acts or omissions specified as the grounds for debarment in the PPB Rules.

48.2 Before the Commissioner shall exercise his/her right to declare the Contractor in default, the Commissioner shall give the Contractor an opportunity to be heard, upon not less than two (2) Days notice.

ARTICLE 49. EXERCISE OF THE RIGHT TO DECLARE DEFAULT

49.1 The right to declare in default for any of the grounds specified or referred to in Article 48 shall be exercised by sending the Contractor a notice, signed by the Commissioner, setting forth the ground or grounds upon which such default is declared (hereinafter referred to as a "Notice of Default").

49.2 The Commissioner's determination that the Contractor is in default shall be conclusive, final and binding on the parties and such a finding shall preclude the Contractor from commencing a plenary action for any damages relating to the Contract. If the Contractor protests the determination of the Commissioner, the Contractor may commence a lawsuit in a court of competent jurisdiction of the State of New York under Article 78 of the New York Civil Practice Law and Rules.

ARTICLE 50. QUITTING THE SITE

50.1 Upon receipt of such notice the Contractor shall immediately discontinue all further operations under this Contract and shall immediately quit the Site, leaving untouched all plant, materials, equipment, tools and supplies then on the Site.

ARTICLE 51. COMPLETION OF THE WORK

51.1 The Commissioner, after declaring the Contractor in default, may then have the Work completed by such means and in such manner, by Contract with or without public letting, or otherwise, as he/she may deem advisable, utilizing for such purpose such of the Contractor's plant, materials, equipment, tools and supplies remaining on the Site, and also such Subcontractors, as he/she may deem advisable.

51.2 After such completion, the Commissioner shall make a certificate stating the expense incurred in such completion, which shall include the cost of re-letting and also the total amount of liquidated damages (at the rate provided for in the Contract) from the date when the Work should have been completed by the Contractor in accordance with the terms hereof to the date of actual completion of the Work. Such certificate shall be binding and conclusive upon the Contractor, its Sureties, and any person claiming under the Contractor, as to the amount thereof.

51.3 The expense of such completion, including any and all related and incidental costs, as so certified by the Commissioner, and any liquidated damages assessed against the Contractor, shall be charged against and deducted out of monies which are earned by the Contractor prior to the date of default. Should the expense of such completion, as certified by the Commissioner, exceed the total sum which would have been payable under the Contract if it had been completed by the Contractor, any excess shall be paid by the Contractor.

ARTICLE 52. PARTIAL DEFAULT

52.1 In case the Commissioner shall declare the Contractor in default as to a part of the Work only, the Contractor shall discontinue such part, shall continue performing the remainder of the Work in strict conformity with the terms of this Contract, and shall in no way hinder or interfere with any Other Contractor(s) or persons whom the Commissioner may engage to complete the Work as to which the Contractor was declared in default.

52.2 The provisions of this Chapter relating to declaring the **Contractor** in default as to the entire **Work** shall be equally applicable to a declaration of partial default, except that the **Commissioner** shall be entitled to utilize for completion of the part of the **Work** as to which the **Contractor** was declared in default only such plant, materials, equipment, tools and supplies as had been previously used by the **Contractor** on such part.

ARTICLE 53. PERFORMANCE OF UNCOMPLETED WORK

53.1 In completing the whole or any part of the **Work** under the provision of this Chapter X, the **Commissioner** shall have the power to depart from or change or vary the terms and provisions of this **Contract**, provided, however, that such departure, change or variation is made for the purpose of reducing the time or expense of such completion. Such departure, change or variation, even to the extent of accepting a lesser or different performance, shall not affect the conclusiveness of the **Commissioner's** certificate of the cost of completion referred to in Article 51, nor shall it constitute a defense to an action to recover the amount by which such certificate exceeds the amount which would have been payable to the **Contractor** hereunder but for its default.

ARTICLE 54. OTHER REMEDIES

54.1 In addition to the right to declare the **Contractor** in default pursuant to this Chapter X, the **Commissioner** shall have the absolute right, in his/her sole discretion and without a hearing, to complete or cause to complete in the same manner as described in Articles 51 and 53, any or all unsatisfactory or uncompleted punch list **Work** that remains after the completion date specified in the Final Approved Punch List. A written notice of the exercise of this right shall be sent to the **Contractor** who shall immediately quit the **Site** in accordance with the provisions of Article 50.

54.2 The previous provisions of this Chapter X shall be in addition to any and all other legal or equitable remedies permissible in the premises.

54.3 The exercise by the **City** of any remedy set forth herein shall not be deemed a waiver by the **City** of any other legal or equitable remedy contained in this **Contract** or provided under **Law**.

54.4 The expense of such completion, including any and all related and incidental costs, as so certified by the **Commissioner**, shall be charged against and deducted out of monies which have been earned by the **Contractor** prior to the date of the exercise of the right set forth in Article 54.1; the balance of such monies, if any, subject to the other provisions of this **Contract**, to be paid to the **Contractor** without interest after such completion. Should the expense of such completion, as certified by the **Commissioner**, exceed the total sum which would have been payable under the **Contract** if it had been completed by the **Contractor**, any excess shall be paid by the **Contractor**.

CHAPTER XI MISCELLANEOUS PROVISIONS

ARTICLE 55. CONTRACTOR'S WARRANTIES

55.1 In consideration of, and to induce, the award of this **Contract** to the **Contractor**, the **Contractor** represents and warrants:

55.1.1 That it is financially solvent, sufficiently experienced and competent to perform the **Work**;
and

55.1.2 That the facts stated in its bid and the information given by it pursuant to the Information for Bidders is true and correct in all respects; and

55.1.3 That it has read and complied with all requirements set forth in the Contract.

ARTICLE 56. CLAIMS AND ACTIONS THEREON

56.1 Any claim, that is not subject to dispute resolution under the PPB Rules or this Contract, against the City for damages for breach of Contract shall not be made or asserted in any lawsuit, unless the Contractor shall have strictly complied with all requirements relating to the giving of notice and of information with respect to such claims, as herein before provided.

56.2 Nor shall any lawsuit be instituted or maintained on any such claims unless such lawsuit is commenced within six (6) months after the date the Commissioner issues a Certificate of Substantial Completion pursuant to Article 44; except that:

56.2.1 Any claims arising out of events occurring after the date the Commissioner issues a Certificate of Substantial Completion and before Final Acceptance of the Work shall be asserted within six (6) months of Final Acceptance of the Work;

56.2.2 Any claims for monies deducted, retained or withheld under the provisions of this Contract shall be asserted within six (6) months after the date when such monies becomes due and payable hereunder; and

56.2.3 If the Commissioner exercises his/her right to terminate the Contract pursuant to Article 64, any such lawsuit shall be commenced within six (6) months of the date the Commissioner exercises said right.

ARTICLE 57. INFRINGEMENT

57.1 The Contractor shall be solely responsible for and shall indemnify the City against any and all claims and judgments for damages for any infringement of copyright and patents or use of patented articles, tools, materials, equipment, appliances or processes in the performance or completion of the Work, including all costs and expenses which the City shall or may incur or be obligated to pay by reason thereof.

ARTICLE 58. NO CLAIM AGAINST OFFICERS, AGENTS OR EMPLOYEES

58.1 No claim whatsoever shall be made by the Contractor against any officer, agent or employee of the City for, or on account of, anything done or omitted to be done in connection with this Contract.

ARTICLE 59. SERVICES OF NOTICES

59.1 The Contractor hereby designates the business address specified in its bid, as the place where all notices, directions or other communications to the Contractor may be delivered, or to which they may be mailed. Actual delivery of any such notice, direction or communication to the aforesaid place, or depositing it in a postpaid wrapper addressed thereto in any post office box (P.O. Box) regularly maintained by the United States Postal Service, shall be conclusively deemed to be sufficient service thereof upon the Contractor as the date of such delivery or deposit.

59.2 Such address may be changed at any time by an instrument in writing, executed and acknowledged by the Contractor, and delivered to the Commissioner.

59.3 Nothing herein contained shall, however, be deemed to preclude or render inoperative the service of any notice, direction or other communication upon the Contractor personally, or, if the Contractor is a corporation, upon any officer thereof.

ARTICLE 60. UNLAWFUL PROVISIONS DEEMED STRICKEN FROM CONTRACT

60.1 If this Contract contains any unlawful provision not an essential part of the Contract and which shall not appear to have been a controlling or material inducement to the making thereof, the same shall be deemed of no effect and shall, upon notice by either party, be deemed stricken from the Contract without affecting the binding force of the remainder.

ARTICLE 61. ALL LEGAL PROVISIONS DEEMED INCLUDED

61.1 It is the intent and understanding of the parties to this Contract that each and every provision of Law required to be inserted in this Contract shall be and is inserted herein. Furthermore, it is hereby stipulated that every such provision is to be deemed to be inserted herein, and if, through mistake or otherwise, any such provision is not inserted, or is not inserted in correct form, then this Contract shall forthwith upon the application of either party be amended by such insertion so as to comply strictly with the Law and without prejudice to the rights of either party hereunder.

ARTICLE 62. TAX EXEMPTION

62.1 The City is exempt from payment of Federal, State, local taxes and Sales and Compensation Use Taxes of the State of New York and of cities and counties on all materials and supplies sold to the City pursuant to the provisions of this Contract. These taxes are not to be included in bids. However, this exemption does not apply to tools, machinery, equipment or other property leased by or to the Contractor or a Subcontractor, or to supplies and materials which even though they are consumed, are not incorporated into the completed Work (consumable supplies), and the Contractor and its Subcontractors shall be responsible for and pay any and all applicable taxes, including Sales and Compensation Use Taxes, on such leased tools, machinery, equipment or other property and upon all such unincorporated supplies and materials.

62.2 The Contractor agrees to sell and the City agrees to purchase all supplies and materials, other than consumable supplies, required, necessary or proper for or incidental to the construction of the Project covered by this Contract. The sum paid under this Contract for such supplies and materials shall be in full payment and consideration for the sale of such supplies and materials herein.

62.2.1 The Contractor agrees to construct the Project and to perform all Work, labor and services rendered, necessary, proper or incidental thereto for the sum shown in the bid for the performance of such Work, labor and services, and the sum so paid pursuant to this Contract for such Work, labor, etc., shall be in full consideration for the performance by the Contractor of all its duties and obligations under this Contract in connection with said Work and labor.

62.3 The purchase by the Contractor of the supplies and materials sold hereunder shall be a purchase or procurement for resale and therefore not subject to the New York State or City Sales or Compensation Use Taxes or any such taxes of cities or counties. The sale of such supplies and materials by the Contractor to the City is exempt from the aforesaid sales or compensating use taxes. With respect to such supplies and materials, the

Contractor, at the request of the **City**, shall furnish to the **City** such Bills of Sale and other instruments as may be required by the **City**, properly executed, acknowledged and delivered assuring to the **City** title to such supplies and materials, free of liens and/or encumbrances, and the **Contractor** shall mark or otherwise identify all such materials as the property of the **City**.

62.4 Title to all materials to be sold by the **Contractor** to the **City** pursuant to the provisions of the **Contract** shall immediately vest in and become the sole property of the **City** upon delivery of such supplies and materials to the **Site** and prior to its becoming a part of the permanent structure and/or construction. Notwithstanding such transfer of title, the **Contractor** shall have the full and continuing responsibility to install such materials and supplies in accordance with the provisions of this **Contract**, protect them, maintain them in a proper condition and forthwith repair, replace and make good any damage thereto, theft or disappearance thereof, and furnish additional materials in place of any that may be lost, stolen or rendered unusable, without cost to the **City**, until such time as the **Work** covered by the **Contract** is fully accepted by the **City**. Such transfer of title shall in no way affect any of the **Contractor's** obligations hereunder. In the event that, after title has passed to the **City**, any of such supplies and materials are rejected as being defective or otherwise unsatisfactory, title to all such supplies and materials shall be deemed to have been transferred back to the **Contractor**.

62.5 The purchase by **Subcontractors** of supplies and materials to be sold hereunder shall also be a purchase or procurement for resale to the **Contractor** (either directly or through other **Subcontractors**) and therefore not subject to the aforesaid Sales or Compensation Use Taxes, provided that the subcontract agreements provide for the resale of such supplies and materials prior to and separate and apart from the incorporation of such supplies and materials into the permanent structure and/or construction and that such subcontract agreements are in a form similar to this **Contract** with respect to the separation of the sale of materials from the **Work** and labor, services, consumable supplies and any other matters to be provided, and provided further that the subcontract agreements provide separate prices for materials and all other services and matters. Such separation shall actually be followed in practice, including the separation of payments for supplies and materials from the payments for other **Work** and labor and other things to be provided.

62.6 The **Contractor** and its **Subcontractors** and **Materialmen** shall obtain any and all necessary **Contractor Exempt Purchase Certificates** or **Resale Certificates** from the appropriate governmental **Agency** or **Agencies**, and furnish a **Contractor Exempt Purchase Certificate** or **Resale Certificate** to all persons, firms or corporations from which they purchase supplies and materials for the performance of the **Work** covered by this **Contract**.

62.7 In the event any of the provisions of this article shall be deemed to be in conflict with any other provisions of this **Contract** or create any ambiguity, then the provisions of this article shall control.

ARTICLE 63. INVESTIGATION(S) CLAUSE

63.1 The parties to this **Contract** agree to cooperate fully and faithfully with any investigation, audit or inquiry conducted by a United States, a State of New York (State) or a **City** governmental **Agency** or authority that is empowered directly or by designation to compel the attendance of witnesses and to examine witnesses under oath, or conducted by the Inspector General of a governmental **Agency** that is a party in interest to the transaction, submitted bid, submitted proposal, **Contract**, lease, permit or license that is the subject of the investigation, audit or inquiry.

63.2 If any person who has been advised that his/her statement, and any information from such statement, will not be used against him/her in any subsequent criminal proceeding refuses to testify before a grand jury or other governmental **Agency** or authority empowered directly or by designation to compel the attendance of witnesses and to examine witnesses under oath concerning the award of or performance under any transaction, agreement, lease, permit, **Contract**, or license entered into with the **City**, the **State**, or any political subdivision or

public authority thereof, or the Port Authority of New York and New Jersey, or any local development corporation within the City, or any public benefit corporation organized under the Laws of the State of New York, or;

63.3 If any person refuses to testify for a reason other than the assertion of his/her privilege against self incrimination in an investigation, audit or inquiry conducted by a City or State governmental Agency or authority empowered directly or by designation to compel the attendance of witnesses and to take testimony under oath, or by the Inspector General of the governmental Agency that is a party in interest in, and is seeking testimony concerning the award of, or performance under any transaction, agreement, lease, permit, Contract, or license entered into with the City, the State, or any political subdivision thereof or any local development corporation within the City, then;

63.4 The Commissioner whose Agency is a party in interest to the transaction, submitted bid, submitted proposal, Contract, lease, permit, or license shall convene a hearing, upon not less than five (5) days written notice to the parties involved to determine if any penalties should attach for the failure of a person to testify.

63.5 If any non-governmental party to the hearing requests an adjournment, the Commissioner who convened the hearing may, upon granting the adjournment, suspend any Contract, lease, permit, or license, pending the final determination pursuant to Article 63.7 without the City incurring any penalty or damages for delay or otherwise.

63.6 The penalties which may attach after a final determination by the Commissioner may include but shall not exceed:

63.6.1 The disqualification for a period not to exceed five (5) years from the date of an adverse determination for any person, or any entity of which such person was a member at the time the testimony was sought, from submitting bids for, or transacting business with, or entering into or obtaining any Contract, lease, permit or license with or from the City; and/or

63.6.2 The cancellation or termination of any and all such existing City Contracts, leases, permits or licenses that the refusal to testify concerns and that have not been assigned as permitted under this Agreement, nor the proceeds of which pledged, to an unaffiliated and unrelated institutional lender for fair value prior to the issuance of the notice scheduling the hearing, without the City incurring any penalty or damages on account of such cancellation or termination; monies lawfully due for goods delivered, Work done, rentals, or fees accrued prior to the cancellation or termination shall be paid by the City.

63.7 The Commissioner shall consider and address in reaching his/her determination and in assessing an appropriate penalty the factors in Articles 63.7.1 and 63.7.2. The Commissioner may also consider, if relevant and appropriate, the criteria established in Articles 63.7.3 and 63.7.4, in addition to any other information which may be relevant and appropriate:

63.7.1 The party's good faith endeavors or lack thereof to cooperate fully and faithfully with any governmental investigation or audit, including but not limited to the discipline, discharge, or disassociation of any person failing to testify, the production of accurate and complete books and records, and the forthcoming testimony of all other members, agents, assignees or fiduciaries whose testimony is sought.

63.7.2 The relationship of the person who refused to testify to any entity that is a party to the hearing, including but not limited to, whether the person whose testimony is sought has an ownership interest in the entity and/or the degree of authority and responsibility the person has within the entity.

63.7.3 The nexus of the testimony sought to the subject entity and its **Contracts**, leases, permits or licenses with the **City**.

63.7.4 The effect a penalty may have on an unaffiliated and unrelated party or entity that has a significant interest in an entity subject to penalties under Article 63.6, provided that the party or entity has given actual notice to the **Commissioner** upon the acquisition of the interest, or at the hearing called for in Article 63.4, gives notice and proves that such interest was previously acquired. Under either circumstance the party or entity shall present evidence at the hearing demonstrating the potential adverse impact a penalty will have on such person or entity.

63.8 Definitions:

63.8.1 The term "license" or "permit" as used herein shall be defined as a license, permit, franchise or concession not granted as a matter of right.

63.8.2 The term "person" as used herein shall be defined as any natural person doing business alone or associated with another person or entity as a partner, director, officer, principal or employee.

63.8.3 The term "entity" as used herein shall be defined as any firm, partnership, corporation, association, joint venture, or person that receives monies, benefits, licenses, leases, or permits from or through the **City** or otherwise transacts business with the **City**.

63.8.4 The term "member" as used herein shall be defined as any person associated with another person or entity as a partner, director, officer, principal or employee.

63.9 In addition to and notwithstanding any other provision of this **Contract**, the **Commissioner** may in his/her sole discretion terminate this **Contract** upon not less than three (3) **Days** written notice in the event the **Contractor** fails to promptly report in writing to the **Commissioner** of the Department of Investigations ("DOI") of the **City** any solicitation of money, goods, requests for future employment or other benefit or thing of value, by or on behalf of any employee of the **City** or other person, firm, corporation or entity for any purpose which may be related to the procurement or obtaining of this **Contract** by the **Contractor**, or affecting the performance of this **Contract**.

ARTICLE 64. TERMINATION BY THE CITY

64.1 In addition to termination pursuant to any other article of this **Contract**, the **Commissioner** may, at any time, terminate this **Contract** by written notice to the **Contractor**. In the event of termination, the **Contractor** shall, upon receipt of such notice, unless otherwise directed by the **Commissioner**:

64.1.1 Stop Work on the date specified in the notice;

64.1.2 Take such action as may be necessary for the protection and preservation of the **City's** materials and property;

64.1.3 Cancel all cancelable orders for material and equipment;

64.1.4 Assign to the **City** and deliver to the **Site** or another location designated by the **Commissioner**, any non-cancelable orders for material and equipment that is not capable of use except in the performance of this **Contract** and has been specifically fabricated for the sole purpose of this **Contract** and not incorporated in the **Work**;

64.1.5 Take no action which will increase the amounts payable by the City under this Contract.

64.2 In the event of termination by the City pursuant to this article, payment to the Contractor shall be in accordance with Articles 64.2.1, 64.2.2 or 64.2.3, to the extent that each respective article applies.

64.2.1 Lump Sum Contracts or Items: On all lump sum Contracts, or on lump sum items in a Contract, the City will pay the Contractor the sum of Articles 64.2.1(a) and 64.2.1(b), less all payments previously made pursuant to this Contract. On lump sum Contracts only, the City will also pay the Contractor an additional sum as provided in 64.2.1(c).

64.2.1(a) For Work completed prior to the notice of termination, the Contractor shall be paid a pro rata portion of the lump sum bid amount, plus approved change orders, based upon the percent completion of the Work, as determined by the Commissioner. For the purpose of determining the pro rata portion of the lump sum bid amount to which the Contractor is entitled, the Bid Breakdown submitted in accordance with Article 41 shall be considered, but shall not be dispositive. The Commissioner's determination hereunder shall be final, binding and conclusive.

64.2.1(b) For non-cancelable material and equipment, less salvage value, that is not capable of use except in the performance of this Contract and has been specifically fabricated for the sole purpose of this Contract, but not yet incorporated in the Work, the Contractor shall be paid the lesser of:

64.2.1(b)(i) The direct cost, as defined in Article 64.2.4; or

64.2.1(b)(ii) The fair and reasonable value, whichever is less, of such material and equipment, plus necessary and reasonable delivery costs.

64.2.1(b)(iii) In addition, the Contractor shall be paid five (5%) percent of Article 64.2.1(b)(i) or Article 64.2.1(b)(ii), whichever applies.

64.2.1(c) Except as otherwise provided in Article 64.2.1(d), on all lump sum Contracts, the Contractor shall be paid the percentage indicated below applied to the difference between the total lump sum bid amount and the total of all payments made prior to the notice of termination plus all payments allowed pursuant to Articles 64.2.1(a) and 64.2.1(b):

64.2.1(c)(i) Five (5%) percent of the first five million (\$5,000,000.) dollars; and

64.2.1(c)(ii) Three (3%) percent of any amount between five million (\$5,000,000.) dollars and fifteen million (\$15,000,000.) dollars; plus

64.2.1(c)(iii) One (1%) percent of any amount over fifteen million (\$15,000,000.) dollars.

64.2.1(d) In the event the City terminates a lump sum Contract pursuant to this article within ninety (90) days after registration of the Contract with the Comptroller, the Contractor shall be paid one (1%) percent of the difference between the lump sum bid amount and the total of all payments made pursuant to this article.

64.2.2 Unit Price Contracts or Items: On all unit price Contracts, or on unit price items in a Contract, the City will pay the Contractor the sum of Articles 64.2.2(a) and 64.2.2(b), less all payments previously made pursuant to this Contract:

64.2.2(a) For all completed units, the unit price stated in the Contract, and

64.2.2(b) For units that have been ordered but are only partially completed, the Contractor will be paid:

64.2.2(b)(i) A pro rata portion of the unit price stated in the Contract based upon the percent completion of the unit and

64.2.2(b)(ii) For non-cancelable material and equipment, payment will be made pursuant to Article 64.2.1(b).

64.2.3 Time and Material Contracts or Items: On all Contracts or items in a Contract where time and material records are specified as the basis for payment of the Work, the Contractor shall be paid in accordance with Article 26, less all payments previously made pursuant to this Contract.

64.2.4 Direct Costs: Direct Costs as used in this article shall mean:

64.2.4(a) The actual purchase price of material and equipment, plus necessary and reasonable delivery costs,

64.2.4(b) The actual cost of labor involved in construction and installation at the Site, and

64.2.4(c) The actual cost of necessary bonds and insurance purchased pursuant to requirements of this Contract less any amounts that have been or should be refunded by the Contractor's sureties or insurance carriers.

64.2.4(d) Direct Cost shall not include overhead.

64.3 In no event shall any payments under this article exceed the Contract price for such items.

64.4 All payments pursuant to this article shall be in the nature of liquidated damages and shall be accepted by the Contractor in full satisfaction of all claims against the City.

64.5 The City may deduct or set off against any sums due and payable pursuant to this article, any deductions authorized by this Contract or by Law (including but not limited to liquidated damages) and any claims it may have against the Contractor. The City's exercise of the right to terminate the Contract pursuant to this article shall not impair or otherwise effect the City's right to assert any claims it may have against the Contractor in a plenary action.

64.6 Where the Work covered by the Contract has been substantially completed, as determined in writing by the Commissioner, termination of the Work shall be handled as an omission of Work pursuant to Articles 29 and 33, in which case a Change Order will be issued to reflect an appropriate reduction in the Contract Sum, or if the amount is determined after final payment, such amount shall be paid by the Contractor.

ARTICLE 65. CHOICE OF LAW, CONSENT TO JURISDICTION AND VENUE

65.1 This Contract shall be deemed to be executed in the City of New York, State of New York, regardless of the domicile of the Contractor, and shall be governed by and construed in accordance with the Laws of the State of New York and the Laws of the United States, where applicable.

65.2 The parties agree that any and all claims asserted against the City arising under this Contract or related thereto shall be heard and determined in the courts of the State of New York ("New York State Courts") located in the City and County of New York. To effect this Contract and intent, the Contractor agrees:

65.2.1 If the City initiates any action against the Contractor in Federal Court or in New York State Court, service of process may be made on the Contractor either in person, wherever such Contractor may be found, or by registered mail addressed to the Contractor at its address as set forth in this Contract, or to such other address as the Contractor may provide to the City in writing; and

65.2.2 With respect to any action between the City and the Contractor in New York State Court, the Contractor hereby expressly waives and relinquishes any rights it might otherwise have:

65.2.2(a) To move to dismiss on grounds of forum non conveniens;

65.2.2(b) To remove to Federal Court; and

65.2.2(c) To move for a change of venue to a New York State Court outside New York County.

65.2.3 With respect to any action brought by the City against the Contractor in Federal Court located in the City, the Contractor expressly waives and relinquishes any right it might otherwise have to move to transfer the action to a United States Court outside the City.

65.2.4 If the Contractor commences any action against the City in a Court located other than in the City and State of New York, upon request of the City, the Contractor shall either consent to a transfer of the action to a State Court of competent jurisdiction located in the City and State of New York or, if the Court where the action is initially brought will not or cannot transfer the action, the Contractor shall consent to dismiss such action without prejudice and may thereafter reinstate the action in a State Court of competent jurisdiction in the City.

65.3 If any provision(s) of this article is held unenforceable for any reason, each and all other provision(s) shall nevertheless remain in full force and effect.

ARTICLE 66. PARTICIPATION IN AN INTERNATIONAL BOYCOTT

66.1 The Contractor agrees that neither the Contractor nor any substantially owned affiliated company is participating or shall participate in an international boycott in violation of the provisions of the Export Administration Act of 1979, as amended, or the regulations of the United States Department of Commerce promulgated thereunder.

66.2 Upon the final determination by the Commerce Department or any other Agency of the United States as to, or conviction of the Contractor or a substantially-owned affiliated company thereof, participation in an international boycott in violation of the provisions of the Export Administration Act of 1979, as amended, or the regulations promulgated thereunder, the Comptroller may, at his/her option, render forfeit and void this Contract.

66.3 The Contractor shall comply in all respects, with the provisions of Section 6-114 of the Administrative Code and the rules and regulations issued by the Comptroller thereunder.

ARTICLE 67. LOCALLY BASED ENTERPRISE PROGRAM

67.1 This Contract is subject to the requirements of Section 6-108.1 of the Administrative Code and regulations promulgated thereunder. No construction Contract shall be awarded unless and until these requirements have been complied with in their entirety.

67.2 Unless specifically waived by the Commissioner with the approval of the Division of Economic and Financial Opportunity of the Department of Business Services, if any portion of the Contract is subcontracted, not less than ten (10%) percent of the total dollar amount of the Contract shall be awarded to locally based enterprise ("LBEs"); except that where less than ten (10%) percent of the total dollar amount of the Contract is subcontracted, such lesser percentage shall be so awarded.

67.3 The prime Contractor shall not require performance and payment bonds from LBE Subcontractors.

67.4 If the Contractor has indicated prior to award that no Work will be subcontracted, no Work shall be subcontracted without the prior approval of the Commissioner, which shall be granted only if the Contractor makes a good faith effort beginning at least six (6) weeks before the Work is to be performed to obtain LBE Subcontractors to perform the Work.

67.5 If the Contractor has not identified sufficient LBE Subcontractors prior to award, it shall sign a letter of compliance stating that it complies with Section 6-108.1 of the Administrative Code, recognizes that achieving the LBE requirement is a condition of its Contract, and shall submit documentation demonstrating its good faith efforts to obtain LBEs. After award, the Contractor shall begin to solicit LBE's to perform subcontracted Work at least six (6) weeks before the date such Work is to be performed and shall demonstrate that a good faith effort has been made to obtain LBE's on each subcontract until it meets the required percentage.

67.6 Failure of the Contractor to comply with the requirements of Section 6-108.1 of the Administrative Code and the regulations promulgated thereunder shall constitute a material breach of Contract. Remedy for such breach of Contract may include the imposition of any or all of the following sanctions:

67.6.1 Reducing a Contractor's compensation by an amount equal to the dollar value of the percentage of the LBE subcontracting requirement not complied with;

67.6.2 Declaring the Contractor in default;

67.6.3 Where non-compliance is by an LBE, de-certifying and declaring the LBE ineligible to participate in the LBE program for a period of up to three (3) years.

ARTICLE 68. ANTITRUST

68.1 The Contractor hereby assigns, sells and transfers to the City all right, title and interest in and to any claims and causes of action arising under the antitrust Laws of New York State or of the United States relating to the particular goods or services purchased or procured by the City under this Contract.

ARTICLE 69. MacBRIDE PRINCIPLES PROVISIONS

69.1 Notice To All Prospective Contractors:

69.1.1 Local Law No. 34 of 1991 became effective on September 10, 1991 and added Section 6-115.1 of the Administrative Code. The local Law provides for certain restrictions on City Contracts to express the opposition of the people of the City to employment discrimination practices in Northern Ireland to promote freedom of work-place opportunity.

69.1.2 Pursuant to Section 6-115.1, prospective Contractors for Contracts to provide goods or services involving an expenditure of an amount greater than ten thousand (\$10,000.) dollars, or for construction involving an amount greater than fifteen thousand (\$15,000.) dollars, are asked to sign a rider in which they covenant and represent, as a material condition of their Contract, that any business operations in Northern Ireland conducted by the Contractor and any individual or legal entity in which the Contractor holds a ten (10%) percent or greater ownership interest in the Contractor will be conducted in accordance with the MacBride Principles of nondiscrimination in employment.

69.1.3 Prospective Contractors are not required to agree to these conditions. However, in the case of Contracts let by competitive sealed bidding, whenever the lowest responsible bidder has not agreed to stipulate to the conditions set forth in this notice and another bidder who has agreed to stipulate to such conditions has submitted a bid within five (5%) percent of the lowest responsible bid for a Contract to supply goods, services or construction of comparable quality, the Agency shall refer such bids to the Mayor, the Speaker or other officials, as appropriate, who may determine, in accordance with applicable Law and rules, that it is in the best interest of the City that the Contract be awarded to other than the lowest responsible pursuant to Section 313(b)(2) of the City Charter.

69.1.4 In the case of Contracts let by other than competitive sealed bidding, if a prospective Contractor does not agree to these conditions, no Agency, elected official or the City Council shall award the Contract to that bidder unless the Agency seeking to use the goods, services or construction certifies in writing that the Contract is necessary for the Agency to perform its functions and there is no other responsible Contractor who will supply goods, services or construction of comparable quality at a comparable price.

69.2 In accordance with Section 6-115.1 of the Administrative Code, the Contractor stipulates that such Contractor and any individual or legal entity in which the Contractor holds a ten (10%) percent or greater ownership interest in the Contractor either:

69.2.1 Have no business operations in Northern Ireland, or

69.2.2 Shall take lawful steps in good faith to conduct any business operations they have in Northern Ireland in accordance with the MacBride Principles, and shall permit independent monitoring of their compliance with such principles.

69.3 For purposes of this Article, the following terms shall have the following meanings:

69.3.1 "MacBride Principles" shall mean those principles relating to nondiscrimination in employment and freedom of work-place opportunity which require employers doing business in Northern Ireland to:

69.3.1(a) increase the representation of individuals from under-represented religious groups in the workforce, including managerial, supervisory, administrative, clerical and technical jobs;

69.3.1(b) take steps to promote adequate security for the protection of employees from under-represented religious groups both at the work-place and while traveling to and from Work;

69.3.1(c) ban provocative religious or political emblems from the workplace;

69.3.1(d) publicly advertise all job openings and make special recruitment efforts to attract applicants from under-represented religious groups;

69.3.1(e) establish layoff, recall and termination procedures which do not in practice favor a particular religious group;

69.3.1(f) abolish all job reservations, apprenticeship restrictions and different employment criteria which discriminate on the basis of religion;

69.3.1(g) develop training programs that will prepare substantial numbers of current employees from under-represented religious groups for skilled jobs, including the expansion of existing programs and the creation of new programs to train, upgrade and improve the skills of workers from under-represented religious groups;

69.3.1(h) establish procedures to assess, identify and actively recruit employees from under-represented religious groups with potential for further advancement; and

69.3.1(i) appoint a senior management staff member to oversee affirmative action efforts and develop a timetable to ensure their full implementation.

69.4 The Contractor agrees that the covenants and representations in Article 69.2 are material conditions to this Contract. In the event the Agency receives information that the Contractor who made the stipulation required by this Article is in violation thereof, the Agency shall review such information and give the Contractor an opportunity to respond. If the Agency finds that a violation has occurred, the Agency shall have the right to declare the Contractor in default and/or terminate this Contract for cause and procure supplies, services or Work from another source in the manner the Agency deems proper. In the event of such termination, the Contractor shall pay to the Agency, or the Agency in its sole discretion may withhold from any amounts otherwise payable to the Contractor, the difference between the Contract price for the uncompleted portion of this Contract and the cost to the Agency of completing performance of this Contract either itself or by engaging another Contractor or Contractors. In the case of a requirement Contract, the Contractor shall be liable for such difference in price for the entire amount of supplies required by the Agency for the uncompleted term of Contractor's Contract. In the case of a construction Contract, the Agency shall also have the right to hold the Contractor in partial or total default in accordance with the default provisions of this Contract, and/or may seek debarment or suspension of the Contractor. The rights and remedies of the Agency hereunder shall be in addition to, and not in lieu of, any rights and remedies the Agency has pursuant to this Contract or by operation of Law.

ARTICLE 70. HEALTH INSURANCE COVERAGE

70.1 If the price for which this Contract was awarded exceeds \$100,000, or if the price for which this Contract was awarded when combined with other construction or services contracts awarded the Contractor by the City in the year prior to award of this Contract exceeds \$100,000, the Contractor, following registration of the Contract, shall be required to submit responses to requests for information regarding the nature of any health

insurance provided by the Contractor to its employees and their spouses and domestic partners, upon request of the Agency or other designated City agency.

ARTICLE 71. PROHIBITION OF TROPICAL HARDWOODS

71.1 Tropical hardwoods, as defined in Section 165 of the New York State Finance Law ("Finance Law"), shall not be utilized in the performance of this Contract except as expressly permitted by Section 165 of the Finance Law.

ARTICLE 72. CONFLICTS OF INTEREST

72.1 Section 2604 of the City Charter and other related provisions of the City Charter, the Administrative Code and the Penal Law are applicable under the terms of this Contract in relation to Conflicts of Interest and shall be extended to Subcontractors authorized to perform Work, labor and services pursuant to this Contract and further, it shall be the duty and responsibility of the Contractor to so inform its respective Subcontractors. Notice is hereby given that, under certain circumstances, penalties may be invoked against the donor as well as the recipient of any form of valuable gift

ARTICLE 73. MERGER CLAUSE

73.1 The Written Contract herein, contains all the terms and conditions agreed upon by the parties hereto, and do other agreement, oral or otherwise, regarding the subject matter of this Contract shall be deemed to exist or to bind any of the parties hereto, or to vary any of the terms contained herein.

ARTICLE 74. STATEMENT OF WORK

74.1 The Contractor shall furnish all labor and materials and perform all Work in strict accordance with the Specifications and Addenda thereto, numbered 3.

ARTICLE 75. COMPENSATION TO BE PAID TO CONTRACTOR

75.1 The City will pay and the Contractor will accept in full consideration for the performance of the Contract, subject to additions and deductions as provided herein, the total sum of: *Two hundred ninety eight thousand five hundred fifty dollars* Dollars, (\$ 298,550.00), this said sum being the Amount at which the Contract was awarded to the Contractor at a public letting thereof, based upon the Contractor's bid for the Contract.

ARTICLE 76. ELECTRONIC FUNDS TRANSFER

76.1 In accordance with Section 6-107.1 of the New York City Administrative Code, the Contractor agrees to accept payments under this Agreement from the City by electronic funds transfer. An electronic funds transfer is any transfer of funds, other than a transaction originated by check, draft or similar paper instrument, which is initiated through an electronic terminal, telephonic instrument or computer or magnetic tape so as to order, instruct or authorize a financial institution to debit or credit an account. Prior to the first payment made under this Agreement, Contractor shall designate one financial institution or other authorized payment agent and shall complete the "EFT Vendor Payment Enrollment Form" (available at <http://www.nyc.gov/dof>) in order to provide the Commissioner of Finance with information necessary for Contractor to receive electronic funds transfer payments through the designated financial institution or authorized payment agent. The crediting of the

amount of a payment to the appropriate account on the books of a financial institution or other authorized payment agent designated by the Contractor shall constitute full satisfaction by the City for the amount of the payment under this agreement. The account information supplied by the Contractor to facilitate the electronic funds transfer shall remain confidential to the fullest extent provided by law.

76.2. The agency head may waive the application of the requirements herein to payments on contracts entered into pursuant to §315 of the City Charter. In addition, the Commissioner of the Department of Finance and the Comptroller may jointly issue standards pursuant to which the contracting agency may waive the requirements hereunder for payments in the following circumstances: (i) for individuals or classes of individuals for whom compliance imposes a hardship; (ii) for classifications or types of checks; or (iii) in other circumstances as may be necessary in the interest of the City.

ARTICLE 77 - PARTICIPATION BY MINORITY-OWNED AND WOMEN-OWNED BUSINESS ENTERPRISES IN CITY PROCUREMENT

NOTICE TO ALL PROSPECTIVE CONTRACTORS

ARTICLE I. M/WBE PROGRAM

Local Law No. 129 of 2005 added Section 6-129 to the Administrative Code of the City of New York. The local law creates a program for participation by minority-owned and women-owned business enterprises (MBEs and WBEs) in City procurement. As stated in the Section 6-129, the intent of the program is to address the impact of discrimination on the City's procurement process, and to promote the public interest in avoiding fraud and favoritism in the procurement process, increasing competition for City business, and lowering contract costs. The contract provisions contained herein are made pursuant to Local Law 129, and the rules of the Department of Small Business Services ("DSBS") promulgated thereunder.

If this Contract is subject to the Minority-Owned and Women-Owned Business Enterprise ("M/WBE") program created by Local Law 129, the specific requirements of M/WBE participation for this Contract are set forth in Schedule B of the Contract (entitled the "Subcontractor Utilization Plan"), and are detailed below. The Contractor must comply with all applicable M/WBE requirements for this Contract. Schedule B of the Contract ("Subcontractor Utilization Plan") is included in the Bid Booklet.

Article I, Part A, below, sets forth provisions related to the participation goals for construction and professional services contracts. Article I, Part B, below, sets forth miscellaneous provisions related to the M/WBE program.

PART A: PARTICIPATION GOALS FOR CONSTRUCTION AND PROFESSIONAL SERVICES CONTRACTS

1. The Target Subcontracting Percentage applicable to this Contract is set forth on Schedule B, Part I to this Contract (see Page 1, line (1)). The "Target Subcontracting Percentage" is the percentage of the total Contract which Agency anticipates that the prime contractor for this Contract would in the normal course of business award to one or more subcontractors for amounts under \$1 million for construction and professional services.

A prospective contractor may seek a full or partial pre-award waiver of the Target Subcontracting Percentage in accordance with Local Law 129 and Part A, Section 10 below. To apply for the a full or partial waiver of the Target Subcontracting Percentage, a prospective contractor must complete Part III (Page 4) of Schedule B, and must submit such request no later than seven (7) days prior to the date and time the bids or proposals are due, in writing to the Agency by e-mail at poped@ddc.nyc.gov or via facsimile at (718) 391-1885. Bidders/proposers who have submitted requests will receive a response by no later than two (2) calendar days prior to the date bids or proposals are due, provided, however, that if that date would fall on a weekend or holiday, a response will be provided by close-of-business on the business day before such weekend or holiday date.

2. The Subcontractor Participation Goals established for this Contract are set forth on Schedule B, Part I to this Contract (see Page 1, line (2) and/or line (3)). The Subcontractor Participation Goals represent a percentage of the

total dollar value of all construction and/or professional services subcontracts under this Agreement for amounts under \$1 million.

3. If Subcontractor Participation Goals have been established for this Contract, Contractor agrees or shall agree as a material term of the Agreement that, with respect to the total amount of the Agreement to be awarded to one or more subcontractors pursuant to subcontracts for amounts under \$1 million, Contractor shall be subject to the Subcontractor Participation Goals, unless the goals are modified by Agency in accordance with Local Law 129 and Part A, Section 11 below.

4. If Subcontractor Participation Goals have been established for this Contract, a prospective contractor shall be required to submit with its bid or proposal, as applicable, a completed Schedule B, Part II Subcontractor Utilization Plan (see Page 2-3) indicating: (a) the percentage of work it intends to subcontract; (b) the percentage of work it intends to award to subcontractors for amounts under \$1 million; (c) in cases where the prospective contractor intends to award subcontracts for amounts under \$1 million, a description of the type and dollar value of work designated for participation by MBEs and/or WBEs; and (d) the general time frames in which such work by MBEs and/or WBEs is scheduled to occur. In the event that this Subcontractor Utilization Plan indicates that the bidder or proposer, as applicable, does not intend to award the Target Subcontracting Percentage, the bid or proposal, as applicable, shall be deemed non-responsive, unless Agency has granted the bidder or proposer, as applicable, a pre-award waiver of the Target Subcontracting Percentage in accordance with Local Law 129 and Part A, Section 10 below.

THE BIDDER/PROPOSER MUST COMPLETE THE SUBCONTRACTOR UTILIZATION PLAN INCLUDED HEREIN (SCHEDULE B, PART II). SUBCONTRACTOR UTILIZATION PLANS WHICH DO NOT INCLUDE THE REQUIRED AFFIRMATIONS WILL BE DEEMED TO BE NON-RESPONSIVE, UNLESS A FULL WAIVER OF THE TARGET SUBCONTRACTING PERCENTAGE IS GRANTED (SCHEDULE B PART III). IN THE EVENT THAT THE CITY DETERMINES THAT VENDOR HAS SUBMITTED A SUBCONTRACTOR UTILIZATION PLAN WHERE THE REQUIRED AFFIRMATIONS ARE COMPLETED BUT OTHER ASPECTS OF THE PLAN ARE NOT COMPLETE, OR CONTAIN A COPY OR COMPUTATION ERROR THAT IS AT ODDS WITH THE AFFIRMATION, THE VENDOR WILL BE NOTIFIED BY THE AGENCY AND WILL BE GIVEN FOUR (4) CALENDAR DAYS FROM RECEIPT OF NOTIFICATION TO CURE THE SPECIFIED DEFICIENCIES AND RETURN A COMPLETED PLAN TO THE AGENCY. FAILURE TO DO SO WILL RESULT IN A DETERMINATION THAT THE BID/PROPOSAL IS NON-RESPONSIVE. RECEIPT OF NOTIFICATION IS DEFINED AS THE DATE NOTICE IS EMAILED OR FAXED (IF THE VENDOR HAS PROVIDED AN EMAIL ADDRESS OR FAX NUMBER), OR NO LATER THAN FIVE (5) DAYS FROM THE DATE OF MAILING OR UPON DELIVERY, IF DELIVERED.

5. Where a Subcontractor Utilization Plan has been submitted, the Contractor shall, within 30 days of issuance by Agency of a notice to proceed, submit a list of proposed persons or entities to which it intends to award subcontracts within the subsequent 12 months. In the case of multi-year contracts, such list shall also be submitted every year thereafter. PLEASE NOTE: If this Contract is a public works project subject to GML §101(5) (i.e., a contract valued at or below \$3M for projects in New York City) or if the Contract is subject to a project labor agreement in accordance with Labor Law §222, and the bidder is required to identify at the time of bid submission its intended subcontractors for the Wicks trades (plumbing and gas fitting; steam heating, hot water heating, ventilating and air conditioning (HVAC); and electric wiring), the Contractor must identify all those to which it intends to award construction subcontracts for any portion of the Wicks trade work at the time of bid submission, regardless of what point in the life of the contract such subcontracts will occur. In identifying intended subcontractors in the bid submission, bidders may satisfy any Subcontractor Participation Goals established for this Contract by proposing one or more subcontractors that are M/WBEs for any portion of the Wicks trade work if the amount to be awarded to such M/WBE subcontractor is under \$1 million. In the event that the Contractor's selection of a subcontractor is disapproved, the Contractor shall have a reasonable time to propose alternate subcontractors.

6. M/WBE firms must be certified by DSBS in order for the Contractor to credit such firms' participation toward the attainment of the M/WBE participation goals. Such certification must occur prior to the firms' commencement of work as subcontractors. A list of M/WBE firms may be obtained from the DSBS website at www.nyc.gov/buycertified, by emailing DSBS at buyer@sbs.nyc.gov, by calling (212) 513-6356, or by visiting or writing DSBS at 110 William St., New York, New York, 10038, 7th floor. Eligible firms that have not yet been certified may contact DSBS in order to seek certification by visiting www.nyc.gov/getcertified, emailing MWBE@sbs.nyc.gov, or calling the DSBS certification helpline at (212) 513-6311.

7. Where a Subcontractor Utilization Plan has been submitted, the Contractor shall, with each voucher for payment, and/or periodically as Agency may require, submit statements, certified under penalty of perjury, which shall include, but not be limited to, the total amount paid to subcontractors (including subcontractors that are not MBEs or WBEs); the

names, addresses and contact numbers of each MBE or WBE hired as a subcontractor pursuant to such plan as well as the dates and amounts paid to each MBE or WBE. The Contractor shall also submit, along with its voucher for final payment, the total amount paid to subcontractors (including subcontractors that are not MBEs or WBEs); and a final list, certified under penalty of perjury, which shall include the name, address and contact information of each subcontractor that is an MBE or WBE hired pursuant to such plan, the work performed by, and the dates and amounts paid to each.

8. If payments made to, or work performed by, MBEs or WBEs are less than the amount specified in the Contractor's Subcontractor Utilization Plan, Agency shall take appropriate action, in accordance with Local Law 129 and Article II below, unless the Contractor has obtained a modification of its Subcontractor Utilization Plan in accordance with Local Law 129 and Part A, Section 11 below.

9. Where a Subcontractor Utilization Plan has been submitted, and the Contractor requests a change order the value of which exceeds 10 percent of the Agreement, Agency shall establish participation goals for the work to be performed pursuant to the change order.

10. **Pre-award waiver of Target Subcontracting Percentage.** Agency may grant a full or partial waiver of the Target Subcontracting Percentage to a bidder or proposer, as applicable, who demonstrates—before submission of the bid or proposal—that it has legitimate business reasons for proposing the level of subcontracting in its Subcontractor Utilization Plan. In making its determination, Agency shall consider factors that shall include, but not be limited to, whether the bidder or proposer, as applicable, has the capacity and the bona fide intention to perform the Contract without any subcontracting, or to perform the Contract without awarding the amount of subcontracts for under one million dollars represented by the Target Subcontracting Percentage. In making such determination, Agency may consider whether the Subcontractor Utilization Plan is consistent with past subcontracting practices of the bidder or proposer, as applicable, and whether the bidder or proposer, as applicable, has made good faith efforts to identify portions of the Contract that it intends to subcontract.

11. **Modification of Subcontractor Utilization Plan.** A Contractor may request a modification of its Subcontractor Utilization Plan (Subcontractor Participation Goals) after award of this Contract. **PLEASE NOTE: If this Contract is a public works project subject to GML §101(5) (i.e., a contract valued at or below \$3M for projects in New York City), or if the Contract is subject to a project labor agreement in accordance with Labor Law §222, and the bidder is required to identify at the time of bid submission its intended subcontractors for the Wicks trades (plumbing and gas fitting; steam heating, hot water heating, ventilating and air conditioning (HVAC); and electric wiring), the Contractor may request a Modification of its Subcontractor Utilization Plan as part of its bid submission.** The Agency may grant a request for Modification of a Contractor's Subcontractor Utilization Plan if it determines that the Contractor has established, with appropriate documentary and other evidence, that it made reasonable, good faith efforts to meet the Subcontractor Participation Goals. In making such determination, Agency shall consider evidence of the following efforts, as applicable, along with any other relevant factors:

- (a) The Contractor advertised opportunities to participate in the Contract, where appropriate, in general circulation media, trade and professional association publications and small business media, and publications of minority and women's business organizations;
- (b) The Contractor provided notice of specific opportunities to participate in the Contract, in a timely manner, to minority and women's business organizations;
- (c) The Contractor sent written notices, by certified mail or facsimile, in a timely manner, to advise MBEs and WBEs that their interest in the Contract was solicited;
- (d) The Contractor made efforts to identify portions of the work that could be substituted for portions originally designated for participation by MBEs and/or WBEs in the Subcontractor Utilization Plan, and for which the Contractor claims an inability to retain MBEs or WBEs;
- (e) The Contractor held meetings with MBEs and/or WBEs prior to the date their bids or proposals were due, for the purpose of explaining in detail the scope and requirements of the work for which their bids or proposals were solicited;
- (f) The Contractor made efforts to negotiate with MBEs and/or WBEs as relevant to perform specific subcontracts;
- (g) Timely written requests for assistance made by the Contractor to Agency's M/WBE liaison officer and to DSBS;
- (h) Description of how recommendations made by DSBS and Agency were acted upon and an explanation of why action upon such recommendations did not lead to the desired level of participation of MBEs and/or WBEs.

Agency's M/WBE officer shall provide written notice to the Contractor of the determination.

12. If this Contract is for an indefinite quantity of construction or professional services or is a requirements type contract and the Contractor has submitted a Subcontractor Utilization Plan and has committed to subcontract work to MBEs and/or WBEs in order to meet the Subcontractor Participation Goals, the Contractor will not be deemed in violation of the M/WBE requirements for this Contract with regard to any work which was intended to be subcontracted to an MBE and/or WBE to the extent that the Agency has determined that such work is not needed.

13. If Subcontractor Participation Goals have been established for this Contract, Agency shall evaluate and assess the Contractor's performance in meeting those goals, and such evaluation and assessment shall become part of the Contractor's overall contract performance evaluation.

PART B: MISCELLANEOUS

1. The Contractor shall take notice that, if this solicitation requires the establishment of a Subcontractor Utilization Plan, the resulting contract may be audited by DSBS to determine compliance with Section 6-129. See 6-129(e)(10). Furthermore, such resulting contract may also be examined by the City's Comptroller to assess compliance with the Subcontractor Utilization Plan.

2. Pursuant to DSBS rules, construction contracts that include a requirement for a Subcontractor Utilization Plan shall not be subject to the law governing Locally Based Enterprises set forth in Administrative Code Section 6-108.1.

3. DSBS is available to assist contractors and potential contractors in determining the availability of MBEs and WBEs to participate as subcontractors, and in identifying opportunities that are appropriate for participation by MBEs and WBEs in contracts.

4. Prospective contractors are encouraged to enter into joint ventures with MBEs and WBEs.

5. By submitting a bid or proposal the Contractor hereby acknowledges its understanding of the M/WBE requirements set forth herein and the pertinent provisions of Local Law 129 of 2005, and any rules promulgated thereunder, and if awarded this Contract, the Contractor hereby agrees to comply with the M/WBE requirements of this Contract and pertinent provisions of Local Law 129 of 2005, and any rules promulgated thereunder, all of which shall be deemed to be material terms of this Contract. The Contractor hereby agrees to make all reasonable, good faith efforts to solicit and obtain the participation of M/WBE's to meet the required Subcontractor Participation Goals.

ARTICLE II. ENFORCEMENT

1. If Agency determines that a bidder or proposer, as applicable, has, in relation to this procurement, violated Section 6-129 or the DSBS rules promulgated pursuant to Section 6-129, Agency may disqualify such bidder or proposer, as applicable, from competing for this Contract and the Agency may revoke such bidder's or proposer's prequalification status, if applicable.

2. Whenever Agency believes that the Contractor or a subcontractor is not in compliance with Section 6-129 or the DSBS rules promulgated pursuant to Section 6-129, or any provision of this Contract that implements Section 6-129, including, but not limited to any Subcontractor Utilization Plan, Agency shall send a written notice to the Contractor describing the alleged noncompliance and offering an opportunity to be heard. Agency shall then conduct an investigation to determine whether such Contractor or subcontractor is in compliance.

3. In the event that the Contractor has been found to have violated Section 6-129, the DSBS rules promulgated pursuant to Section 6-129, or any provision of this Contract that implements this Section 6-129, including, but not limited any Subcontractor Utilization Plan, Agency may determine that one of the following actions should be taken:

- (a) entering into an agreement with the Contractor allowing the Contractor to cure the violation;
- (b) revoking the Contractor's pre-qualification to bid or make proposals for future contracts;
- (c) making a finding that the Contractor is in default of the Contract;
- (d) terminating the Contract;
- (e) declaring the Contractor to be in breach of Contract;
- (f) withholding payment or reimbursement;

- (g) determining not to renew the Contract;
- (h) assessing actual and consequential damages;
- (i) assess liquidated damages or reduction of fees, provided that liquidated damages may be based on amounts representing costs of delays in carrying out the purposes of the program established by Section 6-129, or in meeting the purposes of the Contract, the costs of meeting utilization goals through additional procurements, the administrative costs of investigation and enforcement, or other factors set forth in the Contract;
- (j) exercise rights under the Contract to procure goods, services or construction from another contractor and charge the cost of such contract to the Contractor that has been found to be in noncompliance; or
- (k) take any other appropriate remedy.

4. If a Subcontractor Utilization Plan has been submitted, and pursuant to this Article II, Section 3, the Contractor has been found to have failed to award subcontracts to MBEs and/or WBEs sufficient to meet the Subcontractor Participation Goals contained in its Subcontractor Utilization Plan or the Subcontractor Participation Goals as modified by Agency pursuant to Article I, Part A, Section 11, Agency may assess liquidated damages in the amount of ten percent (10%) of the difference between the dollar amount of subcontracts required to be awarded to MBE and/or WBE subcontractors to meet the Subcontractor Participation Goals and the dollar amount the Contractor actually awarded and paid to MBE and/or WBE subcontractors. In view of the difficulty of accurately ascertaining the loss which the City will suffer by reason of Contractor's failure to meet the Subcontractor Participation Goals, the foregoing amount is hereby fixed and agreed as the liquidated damages that the City will suffer by reason of such failure, and not as a penalty. Agency may deduct and retain out of any monies which may become due under this Contract the amount of any such liquidated damages; and in case the amount which may become due under this Contract shall be less than the amount of liquidated damages suffered by the City, the Contractor shall be liable to pay the difference.

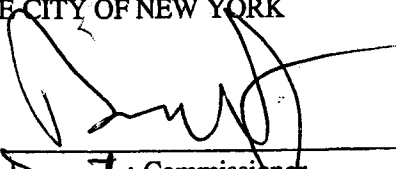
5. Whenever Agency has reason to believe that an MBE or WBE is not qualified for certification, or is participating in a contract in a manner that does not serve a commercially useful function (as defined in Section 6-129), or has violated any provision of Section 6-129, Agency shall notify the commissioner of DSBS who shall determine whether the certification of such business enterprise should be revoked.

6. Statements made in any instrument submitted to Agency pursuant to Section 6-129 shall be submitted under penalty of perjury and any false or misleading statement or omission shall be grounds for the application of any applicable criminal and/or civil penalties for perjury. The making of a false or fraudulent statement by an MBE or WBE in any instrument submitted pursuant to Section 6-129 shall, in addition, be grounds for revocation of its certification.

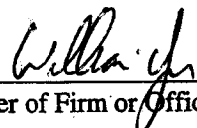
7. The Contractor's record in implementing its Subcontractor Utilization Plan shall be a factor in the evaluation of its performance. Whenever a contracting agency determines that a contractor's compliance with a Subcontractor Utilization Plan has been unsatisfactory, the agency shall, after consultation with the city chief procurement officer, file an advice of caution form for inclusion in VENDEX as caution data.

IN WITNESS WHEREOF, the Commissioner, on behalf of the City of New York, and the Contractor, have executed this agreement in quadruplicate, two parts of which are to remain with the Commissioner, another to be filed with the Comptroller of the City, and the fourth to be delivered to the Contractor.

THE CITY OF NEW YORK

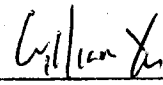
By: 
Deputy Commissioner

CONTRACTOR: Chinatown Pl & Heating

By: 
(Member of Firm or Officer of Corporation)

Title: VP

(Where Contractor is a Corporation, add):
Attest:


Secretary



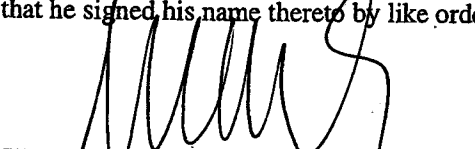
(Seal)

ACKNOWLEDGMENT OF PRINCIPAL, IF A CORPORATION

State of NY County of Queens ss:

On this 7 day of Aug, before me personally came William Y
to me known, who, being by me duly sworn did depose and say that he resides at Queens
that he is the U.P.

of the corporation described in and which executed the foregoing instrument; that he knows the seal of said corporation; that one of the seals affixed to said instrument is such seal; that it was so affixed by order of the directors of said corporation, and that he signed his name thereto by like order.



Notary Public or Commissioner of Deeds

VICTORIA AYO-VAUGHAN
Notary Public, State of New York
Registration #01AY5014042
Qualified In Queens County
Commission Expires July 15, 2015

ACKNOWLEDGMENT OF PRINCIPAL, IF A PARTNERSHIP

State of _____ County of _____ ss:

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

Notary Public or Commissioner of Deeds

ACKNOWLEDGMENT OF PRINCIPAL, IF AN INDIVIDUAL

State of _____ County of _____ ss:

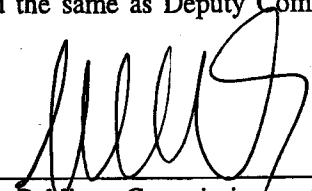
On this _____ day of _____, before me personally appeared _____
to me known, and known to me to be the person described in and who executed the foregoing instrument; and
acknowledged that he executed the same.

Notary Public or Commissioner of Deeds

ACKNOWLEDGMENT BY COMMISSIONER

State of New York County of Queens ss:

On this 8th day of August, before me personally came David Resnick
to me known, and known to be the Deputy Commissioner of the Department of Design and Construction of
The City of New York, the person described as such in and who as such executed the foregoing instrument
and he acknowledged to me that he executed the same as Deputy Commissioner for the purposes therein
mentioned.



Notary Public or Commissioner of Deeds

VICTORIA A. STOUGHTON
Notary Public, State of New York
Registration # 0170014042
Qualified in Queens County
Commission Expires July 13, 2011

AUTHORITY

MAYOR'S CERTIFICATE NO. CBX
BUDGET DIRECTOR'S CERTIFICATE NO.

DATED
DATED

APPROPRIATION
COMMISSIONER'S CERTIFICATE

In conformity with the provisions of Section 6-101 of the Administrative Code of the City of New York, it is hereby certified that the estimated cost of the work, materials and supplies required by the within Contract, amounting to

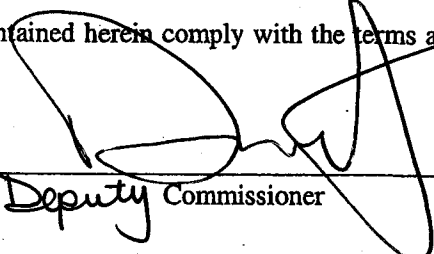
Two hundred ninety eight
thousand five hundred fifty dollars

Dollars (\$ 298,550.00)

is chargeable to the fund of the Department of Design and Construction entitled Code

Department of Design and Construction

I hereby certify that the specifications contained herein comply with the terms and conditions of the BUDGET.



Deputy Commissioner

COMPTROLLER'S CERTIFICATE

The City of New York _____

Pursuant to the provisions of Section 6-101 of the Administrative Code of the City of New York, I hereby certify that there remains unapplied and unexpended a balance of the above mentioned fund applicable to this Contract sufficient to pay the estimated expense of executing the same viz:

\$ _____

Comptroller

**MAYOR'S CERTIFICATE OR
CERTIFICATE OF THE DIRECTOR
OF THE BUDGET**

Performance Bond #1 (Pages 77 to 80): Use if the total contract price is \$5 Million Or Less. Performance Bond #1 has been approved by the U.S. Small Business Administration ("SBA") for participation in its Bond Guarantee Program.

PERFORMANCE BOND #1 (Page 1)

PERFORMANCE BOND #1

KNOW ALL PERSONS BY THESE PRESENTS, That we, _____

hereinafter referred to as the "Principal", and _____

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

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

WHEREAS, the Principal is about to enter, or has entered, into a Contract in writing with the City for

a copy of which Contract is annexed to and hereby made a part of this bond as though herein set forth in full;

Performance Bond #1 (Pages 77 to 80): Use if the total contract price is \$5 Million Or Less. Performance Bond #1 has been approved by the U.S. Small Business Administration ("SBA") for participation in its Bond Guarantee Program.

PERFORMANCE BOND #1 (Page 2)

NOW, THEREFORE, the conditions of this obligation are such that if the Principal, his or its representatives or assigns, shall well and faithfully perform the said Contract and all modifications, amendments, additions and alterations thereto that may hereafter be made, according to its terms and its true intent and meaning, including repair and or replacement of defective work and guarantees of maintenance for the periods stated in the Contract, and shall fully indemnify and save harmless the City from all cost and damage which it may suffer by reason of the Principal's default of the Contract, and shall fully reimburse and repay the City for all outlay and expense which the City may incur in making good any such default and shall protect the said City of New York against, and pay any and all amounts, damages, cost and judgments which may or shall be recovered against said City or its officers or agents or which the said City of New York may be called upon to pay any person or corporation by reason of any damages arising or growing out of the Principal's default of the Contract, then this obligation shall be null and void, otherwise to remain in full force and effect.

The Surety (Sureties), for value received, hereby stipulates and agrees, upon written notice from the City that the City has determined that the Principal is in default of the Contract, to (1) pay the City the cost to complete the contract as determined by the City in excess of the balance of the Contract held by the City, plus any damages or costs to which the City is entitled, up to the full amount of the above penal sum, (2) fully perform and complete the Work to be performed under the Contract, pursuant to the terms, conditions, and covenants thereof, or (3) tender a completion Contractor that is acceptable to the City. The Surety (Sureties) further agrees, at its option, either to notify the City that it elects to pay the city the cost of completion plus any applicable damages and costs under option (1) above, or to commence and diligently perform the Work specified in the Contract, including physical site work, within twenty-five (25) business days after written notice thereof from the City and, if the Surety elects to fully perform and complete the Work, then to complete all Work within the time set forth in the Contract or such other time as agreed to between the City and Surety in accordance with the Contract. If the Surety elects to tender payment pursuant to (1) above, then the Surety shall tender such amount within fifteen (15) business days notification from the City of the cost of completion. The Surety and the City reserve all rights and defenses each may have against the other; provided, however, that the Surety expressly agrees that its reservation of rights shall not provide a basis for non-performance of its obligation to pay the City the cost of completion, to commence and complete all Work as provided herein, or to tender a completion contractor.

The Surety (Sureties), for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of said Surety (Sureties) and its bond shall be in no way impaired or affected by any extension of time, modification, omission, addition, or change in or to the said Contract or the Work to be performed thereunder, or by any payment thereunder before the time required therein, or by any waiver of any provisions thereof, or any moneys due or to become due thereunder; and said Surety (Sureties) does hereby waive notice of any and all of such extensions, modifications, omissions, additions, changes, payments, and waivers, and hereby expressly stipulates and agrees that any and all things done and omitted to be done by and in relation to subcontractors shall have the same effect as to said Surety (Sureties) as though done or omitted to be done by or in relation to said Principal. Notwithstanding the above, if the City makes payments to the Principal before the time required by the contract that in the aggregate exceed \$100,000 or 10% of the Contract price, whichever is less, and that have not become earned prior to the Principal being found to be in default, then all payments made to the Principal before the time required by the Contract shall be added to the remaining contract value available to be paid for the completion of the Contract as if such sums had not been paid to the Principal, but shall not provide a basis for non-performance of its obligation to pay the City the cost of completion, to commence and to complete all Work as provided herein, or to tender a completion contractor.

Performance Bond #1 (Pages 77 to 80): Use if the total contract price is \$5 Million Or Less. Performance Bond #1 has been approved by the U.S. Small Business Administration ("SBA") for participation in its Bond Guarantee Program.

PERFORMANCE BOND #1 (Page 3)

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

(Seal)

_____(L.S.)
Principal

By: _____

(Seal)

Surety

By: _____

(Seal)

Surety

By: _____

(Seal)

Surety

By: _____

Bond Premium Rate _____

Bond Premium Cost _____

If the Contractor (Principal) is a partnership, the bond should be signed by each of the individuals who are partners.

If the Contractor (Principal) is a corporation, the bond should be signed in its correct corporate name by a duly authorized officer, agent, or attorney-in-fact.

There should be executed an appropriate number of counterparts of the bond corresponding to the number of counterparts of the Contract.

Performance Bond #1 (Pages 77 to 80): Use if the total contract price is \$5 Million Or Less. Performance Bond #1 has been approved by the U.S. Small Business Administration ("SBA") for participation in its Bond Guarantee Program.

PERFORMANCE BOND #1 (Page 4)

ACKNOWLEDGMENT OF PRINCIPAL, IF A CORPORATION

State of _____ County of _____ ss:

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

Notary Public or Commissioner of Deeds

ACKNOWLEDGMENT OF PRINCIPAL, IF A PARTNERSHIP

State of _____ County of _____ ss:

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

Notary Public or Commissioner of Deeds

ACKNOWLEDGMENT OF PRINCIPAL, IF AN INDIVIDUAL

State of _____ County of _____ ss:

On this _____ day of _____, _____ before me personally appeared _____ to me known, and known to me to be the person described in and who executed the foregoing instrument; and acknowledged that he executed the same.

Notary Public or Commissioner of Deeds

Each executed bond should be accompanied by: (a) appropriate acknowledgments of the respective parties; (b) appropriate duly certified copy of Power of Attorney or other certificate of authority where bond is executed by agent, officer or other representative of Principal or Surety; (c) a duly certified extract from By-Laws or resolutions of Surety under which Power of Attorney or other certificate of authority of its agent, officer or representative was issued, and (d) certified copy of latest published financial statement of assets and liabilities of Surety.

* * * * *

Affix Acknowledgments and Justification of Sureties.

Performance Bond #2 (Pages 81 to 84): Use if the total contract price is more than \$5 Million.

PERFORMANCE BOND #2 (Page 1)

PERFORMANCE BOND #2

KNOW ALL PERSONS BY THESE PRESENTS, That we, _____

hereinafter referred to as the "Principal", and _____

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

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

WHEREAS, the Principal is about to enter, or has entered, into a Contract in writing with the City for

a copy of which Contract is annexed to and hereby made a part of this bond as though herein set forth in full;

Performance Bond #2 (Pages 81 to 84): Use if the total contract price is more than \$5 Million.

PERFORMANCE BOND #2 (Page2)

NOW, THEREFORE, the conditions of this obligation are such that if the Principal, his or its representatives or assigns, shall well and faithfully perform the said Contract and all modifications, amendments, additions and alterations thereto that may hereafter be made, according to its terms and its true intent and meaning, including repair and or replacement of defective work and guarantees of maintenance for the periods stated in the Contract, and shall fully indemnify and save harmless the City from all cost and damage which it may suffer by reason of the Principal's default of the Contract, and shall fully reimburse and repay the City for all outlay and expense which the City may incur in making good any such default and shall protect the said City of New York against, and pay any and all amounts, damages, cost and judgments which may or shall be recovered against said City or its officers or agents or which the said City of New York may be called upon to pay any person or corporation by reason of any damages arising or growing out of the Principal's default of the Contract, then this obligation shall be null and void, otherwise to remain in full force and effect.

The Surety (Sureties), for value received, hereby stipulates and agrees, upon written notice from the City that the City has determined that the Principal is in default of the Contract, to either (1) pay the full amount of the above penal sum in complete discharge and exoneration of this bond and of all the liabilities of the Surety relating to this bond, or (2) fully perform and complete the Work to be performed under the Contract, pursuant to the terms, conditions, and covenants thereof. The Surety (Sureties) further agrees, at its option, either to tender the penal sum or to commence and diligently perform the Work specified in the Contract, including physical site work, within twenty-five (25) business days after written notice thereof from the City and to complete all Work within the time set forth in the Contract or such other time as agreed to between the City and Surety in accordance with the Contract. The Surety and the City reserve all rights and defenses each may have against the other; provided, however, that the Surety expressly agrees that its reservation of rights shall not provide a basis for non-performance of its obligation to commence and to complete all Work as provided herein.

The Surety (Sureties), for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of said Surety (Sureties) and its bond shall be in no way impaired or affected by any extension of time, modification, omission, addition, or change in or to the said Contract or the Work to be performed thereunder, or by any payment thereunder before the time required therein, or by any waiver of any provisions thereof, or by any assignment, subletting or other transfer thereof or of any Work to be performed or any moneys due or to become due thereunder; and said Surety (Sureties) does hereby waive notice of any and all of such extensions, modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts and transfers, and hereby expressly stipulates and agrees that any and all things done and omitted to be done by and in relation to assignees, subcontractors, and other transferees shall have the same effect as to said Surety (Sureties) as though done or omitted to be done by or in relation to said Principal.

Performance Bond #2 (Pages 81 to 84): Use if the total contract price is more than \$5 Million.

PERFORMANCE BOND #2 (Page 3)

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

(Seal) _____ (L.S.)
Principal

By: _____

(Seal) _____
Surety

By: _____

(Seal) _____
Surety

By: _____

(Seal) _____
Surety

By: _____

(Seal) _____
Surety

By: _____

(Seal) _____
Surety

Bond Premium Rate _____

Bond Premium Cost _____

If the Contractor (Principal) is a partnership, the bond should be signed by each of the individuals who are partners.

If the Contractor (Principal) is a corporation, the bond should be signed in its correct corporate name by a duly authorized officer, agent, or attorney-in-fact.

There should be executed an appropriate number of counterparts of the bond corresponding to the number of counterparts of the Contract.

Performance Bond #2 (Pages 81 to 84): Use if the total contract price is more than \$5 Million.

PERFORMANCE BOND #2 (Page 4)

ACKNOWLEDGMENT OF PRINCIPAL, IF A CORPORATION

State of _____ County of _____ ss:

On this _____ day of _____, 20____ before me personally came _____ to me known, who, being by me duly sworn did depose and say that he/she resides at _____; that he/she is the _____ of _____ the corporation described in and which executed the foregoing instrument; and that he signed his name to the foregoing instrument by order of the directors of said corporation as the duly authorized and binding act thereof.

Notary Public or Commissioner of Deeds

ACKNOWLEDGMENT OF PRINCIPAL, IF A PARTNERSHIP

State of _____ County of _____ ss:

On this _____ day of _____, 20____ before me personally came _____ to me known, who, being by me duly sworn did depose and say that he/she resides at _____; that he/she is _____ partner of _____, a limited/general partnership existing under the laws of the State of _____ the partnership described in and which executed the foregoing instrument; and that he/she signed his/her name to the foregoing instrument as the duly authorized and binding act of said partnership.

Notary Public or Commissioner of Deeds

ACKNOWLEDGMENT OF PRINCIPAL, IF AN INDIVIDUAL

State of _____ County of _____ ss:

On this _____ day of _____, 20____ before me personally came _____ to me known, who, being by me duly sworn did depose and say that he/she resides at _____, and that he/she is the individual whose name is subscribed to the within instrument and acknowledged to me that by his/her signature on the instrument, said individual executed the instrument.

Notary Public or Commissioner of Deeds

Each executed bond should be accompanied by: (a) appropriate acknowledgments of the respective parties; (b) appropriate duly certified copy of Power of Attorney or other certificate of authority where bond is executed by agent, officer or other representative of Principal or Surety; (c) a duly certified extract from By-Laws or resolutions of Surety under which Power of Attorney or other certificate of authority of its agent, officer or representative was issued, and (d) certified copy of latest published financial statement of assets and liabilities of Surety.

* * * * *

Affix Acknowledgments and Justification of Sureties.

Payment Bond (Pages 85 to 88): Use for any contract for which a Payment Bond is required.

PAYMENT BOND (Page 1)

PAYMENT BOND

KNOW ALL PERSONS BY THESE PRESENTS, That we, _____

hereinafter referred to as the "Principal", and _____

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

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

WHEREAS, the Principal is about to enter, or has entered, into a Contract in writing with the City for

a copy of which Contract is annexed to and hereby made a part of this bond as though herein set forth in full;

NOW, THEREFORE, the conditions of this obligation are such that if the Principal, his or its representatives or assigns and other Subcontractors to whom Work under this Contract is sublet and his or their successors and assigns shall promptly pay or cause to be paid all lawful claims for

(a) Wages and compensation for labor performed and services rendered by all persons engaged in the prosecution of the Work under said Contract, and any amendment or extension thereof or addition thereto, whether such persons be agents servants or employees of the Principal or any such Subcontractor, including all persons so

Payment Bond (Pages 85 to 88): Use for any contract for which a Payment Bond is required.

PAYMENT BOND (Page 2)

engaged who perform the work of laborers or mechanics at or in the vicinity of the site of the Project regardless of any contractual relationship between the Principal or such Subcontractors, or his or their successors or assigns, on the one hand and such laborers or mechanics on the other, but not including office employees not regularly stationed at the site of the project; and

(b) Materials and supplies (whether incorporated in the permanent structure or not), as well as teams, fuels, oils, implements or machinery furnished, used or consumed by said Principal or any subcontractor at or in the vicinity of the site of the Project in the prosecution of the Work under said Contract and any amendment or extension thereof or addition thereto; then this obligation shall be void, otherwise to remain in full force and effect.

This bond is subject to the following additional conditions, limitations and agreements:

(a) The Principal and Surety (Sureties) agree that this bond shall be for the benefit of any materialmen or laborer having a just claim, as well as the City itself.

(b) All persons who have performed labor, rendered services or furnished materials and supplies, as aforesaid, shall have a direct right of action against the Principal and his, its or their successors and assigns, and the Surety (Sureties) herein, or against either or both or any of them and their successors and assigns. Such persons may sue in their own name, and may prosecute the suit to judgment and execution without the necessity of joining with any other persons as party plaintiff.

(c) The Principal and Surety (Sureties) agree that neither of them will hold the City liable for any judgment for costs of otherwise, obtained by either or both of them against a laborer or materialman in a suit brought by either a laborer or materialman under this bond for moneys allegedly due for performing work or furnishing material.

(d) The Surety (Sureties) or its successors and assigns shall not be liable for any compensation recoverable by an employee or laborer under the Workmen's Compensation Law.

(e) In no event shall the Surety (Sureties), or its successors or assigns, be liable for a greater sum than the penalty of this bond or be subject to any suit, action or proceeding hereon that is instituted by any person, firm, or corporation hereunder later than two years after the complete performance of said Contract and final settlement thereof.

The Principal, for himself and his successors and assigns, and the Surety (Sureties), for itself and its successors and assigns, do hereby expressly waive any objection that might be interposed as to the right of the City to require a bond containing the foregoing provisions, and they do hereby further expressly waive any defense which they or either of them might interpose to an action brought hereon by any person, firm or corporation, including subcontractors, materialmen and third persons, for work, labor, services, supplies or material performed rendered, or furnished as aforesaid upon the ground that there is no law authorizing the City to require the foregoing provisions to be placed in this bond.

And the Surety (Sureties), for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of said Surety (Sureties), and its bonds shall be in no way impaired or affected by any extension of time, modification, omission, addition, or change in or of the said Contract or the work to be performed thereunder, or by any payment thereunder before the time required therein, or by any waiver of any provisions thereof, or by any assignment, subletting or other transfer thereof or of any part thereof, or of any Work to be performed, or any moneys due to become due thereunder and said Surety (Sureties) does hereby waive notice of any and all of such extensions, modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts and transfers, and hereby expressly stipulates and agrees that any and all things done and omitted to be done by and in relation to assignees, Subcontractors, and other transferees shall have the same effect as to said Surety (Sureties) as though done or omitted to be done or in relation to said Principal.

Payment Bond (Pages 85 to 88): Use for any contract for which a Payment Bond is required.

PAYMENT BOND (Page 3)

IN WITNESS HEREOF, the Principal and the Surety (Sureties) have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereunto affixed and these presents to be signed by their proper officers, this _____ day of _____, _____.

(Seal) _____ (L.S.)
Principal

By: _____

(Seal) _____
Surety

By: _____

(Seal) _____
Surety

By: _____

(Seal) _____
Surety

By: _____

(Seal) _____
Surety

By: _____

If the Contractor (Principal) is a partnership, the bond should be signed by each of the individuals who are partners.

If the Contractor (Principal) is a corporation, the bond should be signed in its correct corporate name by a duly authorized officer, agent, or attorney-in-fact.

There should be executed an appropriate number of counterparts of the bond corresponding to the number of counterparts of the Contract.

Payment Bond (Pages 85 to 88): Use for any contract for which a Payment Bond is required.

PAYMENT BOND (Page 4)

ACKNOWLEDGMENT OF PRINCIPAL, IF A CORPORATION

State of _____ County of _____ ss:

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

Notary Public or Commissioner of Deeds

ACKNOWLEDGMENT OF PRINCIPAL, IF A PARTNERSHIP

State of _____ County of _____ ss:

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

Notary Public or Commissioner of Deeds

ACKNOWLEDGMENT OF PRINCIPAL, IF AN INDIVIDUAL

State of _____ County of _____ ss:

On this _____ day of _____, _____ before me personally appeared _____ to me known, and known to me to be the person described in and who executed the foregoing instrument; and acknowledged that he executed the same.

Notary Public or Commissioner of Deeds

Each executed bond should be accompanied by: (a) appropriate acknowledgments of the respective parties; (b) appropriate duly certified copy of Power of Attorney or other certificate of authority where bond is executed by agent, officer or other representative of Principal or Surety; (c) a duly certified extract from By-Laws or resolutions of Surety under which Power of Attorney or other certificate of authority of its agent, officer or representative was issued, and (d) certified copy of latest published financial statement of assets and liabilities of Surety.

* * * * *

Affix Acknowledgments and Justification of Sureties

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 PREVAILING WAGE SCHEDULE

LABOR LAW §220 PREVAILING WAGE SCHEDULE

Workers, Laborers and Mechanics employed on a public work project must receive not less than the prevailing rate of wage and benefits for the classification of work performed by each upon such public work. Pursuant to Labor Law §220 the Comptroller of the City of New York has promulgated this schedule solely for Workers, Laborers and Mechanics engaged by private contractors on New York City public work contracts.

Contracting agencies anticipating doing work which requires the employment of a trade or classification not included in this schedule must request the Comptroller to establish a proper classification for the work pursuant to Labor Law §220 (3-a) (a). The prevailing rate schedule as promulgated by the Comptroller, must, in compliance with law, be annexed to and form part of the contract.

Contractors are solely responsible for maintaining original payroll records which delineate, among other things, the hours each employee worked within a given classification. Contractors using rates and/or classifications not promulgated by the Comptroller do so at their own risk. Additionally, prior to bid, Agency Chief Contracting Officers must contact the Bureau of Labor Law when the need arises for a work classification not published in this schedule.

The appropriate schedule of prevailing wages and benefits must be posted at all public work sites pursuant to Labor Law §220 (3-a) (a).

This schedule is applicable for work performed during the effective period, unless otherwise noted. You will be notified of any changes to this schedule by addenda published on our web site at www.comptroller.nyc.gov. The rate of wages and supplemental benefits to be paid or provided are those that prevail at the time the work is being performed. Preliminary schedules for future one-year periods are published annually in the City Record on or about June 1st of each succeeding year. Final schedules are published on or about July 1st in the City Record and on our web site at www.comptroller.nyc.gov.

The Comptroller's Office has attempted to include all overtime, shift and night differential, Holiday, Saturday, Sunday or other premium time work. However, this schedule does not set forth every prevailing practice with respect to such rates with which employers must comply. All such practices are nevertheless part of the employer's prevailing wage obligation and contained in the collective bargaining agreements of the prevailing wage unions. These collective bargaining agreements are available for inspection by appointment. Requests for appointments may be made by calling (212) 669-4443, Monday through Friday between the hours of 9 a.m. and 5 p.m.

Answers to questions concerning prevailing trade practices may be obtained from the Classification Unit by calling (212) 669-7974. Please direct all other compliance issues to: Bureau of Labor Law, Attn: Wasyl Kinach, P.E., Office of the Comptroller, 1 Centre Street, Room 1122, New York, N.Y. 10007; Fax (212) 669-4002.

Prevailing rates and ratios for apprentices are attached to this schedule in the Appendix. Pursuant to Labor Law §220 (3-e), only apprentices who are individually registered in a bona fide program to which the employer contractor is a participant, registered with the New York State Department of Labor, may be employed on a public work project. Workers who are not journey persons or not registered apprentices pursuant to Labor Law §220 (3-e) may not be substituted for apprentices and must be paid as journey persons.

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 PREVAILING WAGE SCHEDULE

Contractors are advised to review the applicable Collective Bargaining Agreements and the Comptroller's Prevailing Wage Schedule before bidding on Public Work. If there are any questions concerning prevailing wages, benefits, overtime, Holiday pay, shift differentials or any prevailing practice, please contact this office.

Public Work construction, reconstruction, demolition, excavation, rehabilitation, repair, renovation, alteration, or improvement contracts awarded pursuant to a Project Labor Agreement ("PLA") in accordance with Labor Law section 222 may have different labor standards for shift, premium and overtime work. Please refer to the PLA's pre-negotiated labor agreements for wage and benefit rates applicable to work performed outside of the regular workday. More information is available at the Mayor's Office of Contract Services (MOCS) web page at <http://www.nyc.gov/html/mocs/html/vendors/pla.shtml>.

All the provisions of Labor Law section 220 remain applicable to PLA work including, but not limited to, the enforcement of prevailing wage requirements by the Comptroller; however, we will enforce shift, premium, overtime and other non-standard rates as they appear in a project's pre-negotiated labor agreement.

Any error as to compensation under the prevailing wage law or other information as to trade classification, made by the contracting agency in the contract documents or in any other communication, will not preclude a finding against the contractor of prevailing wage violation.

In order to meet their obligation to provide prevailing supplemental benefits to each covered employee, employers must either:

- 1) Provide bona-fide benefits which cost the employer no less than the prevailing supplemental benefits rate; or
- 2) Supplement the employee's hourly wage by an amount no less than the prevailing supplemental benefits rate; or
- 3) Provide a combination of bona-fide benefits and wage supplements which cost the employer no less than the prevailing supplemental benefits rate in total.

Particular attention should be given to the supplemental benefits requirement. Although in most instances the payment or provision for supplemental benefits is for each hour worked, some classifications require the payment or provision of supplemental benefits for each hour paid. Consequently, some prevailing practices require benefits to be purchased at the overtime, shift differential, Holiday, Saturday, Sunday or other premium time rate.

Benefits are paid for EACH HOUR WORKED unless otherwise noted.

Wasył Kinach, P.E.
Director of Classifications
Bureau of Labor Law

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OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 PREVAILING WAGE SCHEDULE

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ASBESTOS HANDLER

(Hazardous Material; Disturbs, removes, encapsulates, repairs, or encloses friable asbestos material)

Asbestos Handler

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: **\$35.90**

Supplemental Benefit Rate per Hour: **\$15.05**

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Sunday.

Time and one half the regular hourly rate after 40 hours in any work week.

Overtime Holidays

Time and one half the regular rate for work on the following holiday(s).

New Year's Day

Good Friday

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Christmas Day

Easter

Paid Holidays

None

(Local #78 and Local #12A)

BLASTER

Blaster

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: **\$44.40**

Supplemental Benefit Rate per Hour: **\$38.44**

Blaster (Hydraulic)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: **\$45.17**

Supplemental Benefit Rate per Hour: **\$38.44**

Blaster - Trac Drill Hydraulic

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$40.04

Supplemental Benefit Rate per Hour: \$38.44

Blaster - Wagon: Air Trac: Quarry Bar: Drillrunners

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$39.30

Supplemental Benefit Rate per Hour: \$38.44

Blaster - Operators of Jack Hammers

Chippers: Spaders: Concrete Breakers: and all other pneumatic tools of like usage: Walk Behind Self Propelled Hydraulic Asphalt and Concrete Breakers: Hydro (Water) Demolition

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$38.32

Supplemental Benefit Rate per Hour: \$38.44

Blaster - Powder Carriers

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$34.66

Supplemental Benefit Rate per Hour: \$38.44

Blaster - Hydraulic Trac Drill Chuck Tender

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$33.46

Supplemental Benefit Rate per Hour: \$38.44

Blaster - Chuck Tender & Nipper

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$32.75

Supplemental Benefit Rate per Hour: \$38.44

Blaster - Magazine Keepers: (Watch Person)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$19.76

Supplemental Benefit Rate per Hour: \$38.44

Overtime Description

Magazine Keepers:

Time and one half for work performed in excess of forty (40) hours per week and for work performed on Saturdays, Sundays and Holidays.

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 PREVAILING WAGE SCHEDULE

All Other Employees:

Time and one-half for the first eight hours of work on Saturday and for Make-up Time. Double time for all hours over eight Monday through Friday (except make-up hours) and for all hours worked on Sunday and Holidays.

Overtime

Double time the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Presidential Election Day

Thanksgiving Day

Christmas Day

Paid Holidays

None

Shift Rates

A single shift shall be 8 hours plus an unpaid lunch, starting at 8:00 A.M (or between 6:00 A.M. and 10:00 A.M. on weekdays). When two (2) shifts are employed, each shift shall be 8 hours plus ½ hour unpaid lunch. When three (3) shifts are employed, each shift will work seven and one-half (7 ½) hours, but will be paid for eight (8) hours, since only one-half (½) hour is allowed for mealtime. When two (2) or more shifts are employed, single time will be paid for each shift. The first 8 hours of any and all work performed Monday through Friday inclusive of any off-shift shall be at the single time rate.

(Local #29)

BOILERMAKER

Boilermaker

Effective Period: 7/1/2013 - 12/31/2013

Wage Rate per Hour: **\$49.47**

Supplemental Benefit Rate per Hour: **\$39.78**

Supplemental Note: The above rate applies to repair or maintenance and new construction; For time and one half overtime - \$59.08; For double overtime - \$78.37.

Effective Period: 1/1/2014 - 6/30/2014

Wage Rate per Hour: **\$50.45**

Supplemental Benefit Rate per Hour: **\$41.31**

Supplemental Note: The above rate applies to repair or maintenance and new construction; For time and one half overtime - \$61.37; For double overtime - \$81.43.

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 PREVAILING WAGE SCHEDULE

Overtime Description

For Repair and Maintenance work:
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
For New Construction work:
Double time the regular rate after an 8 hour day.
Double time the regular time rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day
President's Day
Memorial Day
Independence Day
Columbus Day
Election Day
Veteran's Day
Thanksgiving Day
Christmas Day

Quadruple time the regular rate for work on the following holiday(s).

Labor Day

Paid Holidays

Good Friday
Day after Thanksgiving
Day before Christmas
Day before New Year's Day

Shift Rates

When shifts are required, the first shift shall work eight (8) hours at the regular straight-time hourly rate. The second shift shall work seven and one-half (7 ½) hours and receive eight hours at the regular straight time hourly rate plus twenty-five cents (\$0.25) per hour. The third shift shall work seven (7) hours and receive eight hours at the regular straight time hourly rate plus fifty cents (\$0.50) per hour. A thirty (30) minute lunch period shall not be considered as time worked. Work in excess of the above shall be paid overtime at the appropriate new construction work or repair work overtime wage and supplemental benefit hourly rate.

(Local #5)

BRICKLAYER

Bricklayer

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$46.44

Supplemental Benefit Rate per Hour: \$27.53

Overtime

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 PREVAILING WAGE SCHEDULE

Time and one half the regular rate after a 7 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Christmas Day

Paid Holidays

None

Shift Rates

Overtime rates to be paid outside the regular scheduled work day.

(Bricklayer District Council)

CARPENTER - BUILDING COMMERCIAL

Building Commercial

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$48.08

Supplemental Benefit Rate per Hour: \$41.10

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

Washington's Birthday

Memorial Day

Independence Day

Labor Day

Columbus Day

Presidential Election Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 PREVAILING WAGE SCHEDULE

Paid Holidays

None

Shift Rates

The second shift will receive one hour at the double time rate of pay for the last hour of the shift; eight hours pay for seven hours of work, nine hours pay for eight hours of work. There must be a first shift in order to work a second shift.

(Carpenters District Council)

CARPENTER - HEAVY CONSTRUCTION WORK
(Construction of Engineering Structures and Building Foundations)

Heavy Construction Work

Effective Period: 7/1/2013 - 7/17/2013

Wage Rate per Hour: \$46.74

Supplemental Benefit Rate per Hour: \$42.37

Effective Period: 7/18/2013 - 6/30/2014

Wage Rate per Hour: \$46.82

Supplemental Benefit Rate per Hour: \$44.97

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Presidential Election Day

Thanksgiving Day

Christmas Day

Paid Holidays

None

Shift Rates

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 PREVAILING WAGE SCHEDULE

Off shift work commencing between 5:00 P.M. and 11:00 P.M. shall work eight and one half hours allowing for one half hour for lunch. The wage rate shall be 113% of the straight time hourly wage rate.

(Carpenters District Council)

CEMENT & CONCRETE WORKER

Cement & Concrete Worker

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$42.33

Supplemental Benefit Rate per Hour: \$26.17

Supplemental Note: \$28.92 on Saturdays; \$31.67 on Sundays & Holidays

Overtime Description

Time and one half the regular rate after 7 hour day (time and one half the regular rate after an 8 hour day when working with Dockbuilders on pile cap forms and for work below street level to the top of the foundation wall, not to exceed 2 feet or 3 feet above the sidewalk-brick shelf, when working on the foundation and structure.)

Overtime

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

President's Day

Good Friday

Memorial Day

Independence Day

Labor Day

Columbus Day

Presidential Election Day

Thanksgiving Day

Christmas Day

Paid Holidays

1/2 day before Christmas Day

1/2 day before New Year's Day

Shift Rates

On shift work extending over a twenty-four hour period, all shifts are paid at straight time.

(Cement Concrete Workers District Council)

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 PREVAILING WAGE SCHEDULE

CEMENT MASON

Cement Mason

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: **\$38.63**

Supplemental Benefit Rate per Hour: **\$39.05**

Supplemental Note: Overtime supplemental benefit rate per hour: **\$57.55**

Overtime Description

Time and one-half the regular rate after an 8 hour day, double time the regular rate after 10 hours. Time and one-half the regular rate on Saturday, double time the regular rate after 10 hours. Double time the regular rate on Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

President's Day

Good Friday

Memorial Day

Independence Day

Labor Day

Columbus Day

Presidential Election Day

Thanksgiving Day

Christmas Day

Paid Holidays

Any worker who reports to work on Christmas Eve or New Year's Eve pursuant to his employer's instruction shall be entitled to three (3) hours afternoon pay without working.

Shift Rates

For an off shift day, (work at times other than the regular 7:00 A.M. to 3:30 P.M. work day) a cement mason shall be paid at the regular hourly rate plus a 25% per hour differential. Four Days a week at Ten (10)hour day.

(Local #780)

CORE DRILLER

Core Driller

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: **\$35.44**

Supplemental Benefit Rate per Hour: **\$19.75**

Core Driller Helper

Effective Period: 7/1/2013 - 6/30/2014

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 PREVAILING WAGE SCHEDULE

Wage Rate per Hour: \$28.60
Supplemental Benefit Rate per Hour: \$19.75

Core Driller Helper(Third year in the industry)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$25.74
Supplemental Benefit Rate per Hour: \$19.75

Core Driller Helper (Second year in the industry)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$22.88
Supplemental Benefit Rate per Hour: \$19.75

Core Driller Helper (First year in the industry)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$20.02
Supplemental Benefit Rate per Hour: \$19.75

Overtime Description

Time and one half the regular rate for work on a holiday plus Holiday pay when worked.

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Time and one half the regular rate for work on the following holiday(s).

Paid Holidays

New Year's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Shift Rates

The shift day shall be the continuous eight and one-half (8½) hours from 6:00 A.M. to 2:30 P.M. and from 2:30 P.M. to 11:00 P.M., including one-half (½) hour of employees regular rate of pay for lunch. When two (2) or more shifts are employed, single time shall be paid for each shift, but those employees employed on a shift other than from 8:00 A.M. to 5:00 P.M. shall, in addition, receive seventy-five cents (\$0.75) per hour differential for each hour worked. When three (3) shifts are needed, each shift shall work seven and one-half (7 ½) hours paid for eight (8) hours of labor and be permitted one-half (½) hour for mealtime.

(Carpenters District Council)

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 PREVAILING WAGE SCHEDULE

DERRICKPERSON AND RIGGER

Derrick Person & Rigger

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$41.00

Supplemental Benefit Rate per Hour: \$46.07

Supplemental Note: The above supplemental rate applies for work performed in Manhattan, Bronx, Brooklyn and Queens. \$47.49 - For work performed in Staten Island.

Derrick Person & Rigger - Site Work

For site work where no rigging is involved.

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$30.00

Supplemental Benefit Rate per Hour: \$31.32

Overtime Description

The first two hours of overtime on weekdays and the first seven hours of work on Saturdays are paid at time and one half for wages and supplemental benefits. All additional overtimes is paid at double time for wages and supplemental benefits. Deduct \$1.42 from the Staten Island hourly benefits rate before computing overtime.

Overtime

Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

Washington's Birthday

Good Friday

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Christmas Day

Paid Holidays

1/2 day on Christmas Eve if work is performed in the A.M.

(Local #197)

DIVER

Diver (Marine)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$59.40

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 PREVAILING WAGE SCHEDULE

Supplemental Benefit Rate per Hour: **\$44.97**

Diver Tender (Marine)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: **\$42.05**

Supplemental Benefit Rate per Hour: **\$44.97**

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Presidential Election Day

Thanksgiving Day

Christmas Day

Paid Holidays

None

Shift Rates

When three shifts are utilized each shift shall work seven and one half-hours (7 1/2 hours) and paid for 8 hours, allowing for one half hour for lunch.

(Carpenters District Council)

DOCKBUILDER - PILE DRIVER

Dockbuilder - Pile Driver

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: **\$46.82**

Supplemental Benefit Rate per Hour: **\$44.97**

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

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§220 PREVAILING WAGE SCHEDULE

Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Christmas Day

Paid Holidays

None

Shift Rates

Off shift work commencing between 5:00 P.M. and 11:00 P.M. shall work eight and one half hours allowing for one half hour for lunch. The wage rate shall be 113% of the straight time hourly wage rate.

(Carpenters District Council)

DRIVER: TRUCK (TEAMSTER)

Driver - Automobile Chauffeur (Dump Truck)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$38.11

Supplemental Benefit Rate per Hour: \$40.20

Driver - Heavy Equipment Trailer Driver

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$39.61

Supplemental Benefit Rate per Hour: \$40.20

Note: For time and one half overtime Wage Rate - \$57.16; for double time overtime Wage Rate - \$76.21

Driver - Euclid & Turnapull Operator

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$38.67

Supplemental Benefit Rate per Hour: \$40.20

Driver - Six Wheeler(3 Axle) Tractors & Trailers

Effective Period: 7/1/2013 - 6/30/2014

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
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Wage Rate per Hour: \$39.11

Supplemental Benefit Rate per Hour: \$40.20

Note: For time and one half overtime Wage Rate - \$58.01; for double time overtime Wage Rate - \$77.34

Driver - Boom Truck

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$39.36

Supplemental Benefit Rate per Hour: \$40.20

Note: For time and one half overtime Wage Rate - \$58.01; for double time overtime Wage Rate - \$77.34

Overtime Description

For Paid Holidays: Holiday pay for all holidays shall be prorated based two hours per day for each day worked in the holiday week, not to exceed 8 hours of holiday pay. For Thanksgiving week, the prorated share shall be 5 1/3 hours of holiday pay for each day worked in Thanksgiving week.

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Veteran's Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

Paid Holidays

New Year's Day

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Veteran's Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

Driver - Redi-Mix Driver (Sand & Gravel)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$35.71

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
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Supplemental Benefit Rate per Hour: \$37.27

Overtime Description

For Paid Holidays: Employees working two (2) days in the calendar week in which the holiday falls are to be paid for these holidays, provided they shape each remaining workday during that calendar week.

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

President's Day

Columbus Day

Veteran's Day

Triple time the regular rate for work on the following holiday(s).

New Year's Day

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Christmas Day

Paid Holidays

New Year's Day

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Election Day

Thanksgiving Day

Christmas Day

(Local #282)

ELECTRICIAN

(Including all low voltage cabling carrying data; video; and voice in combination with data and or video.)

Electrician "A" (Regular Day)

Effective Period: 7/1/2013 - 5/13/2014

Wage Rate per Hour: \$52.00

Supplemental Benefit Rate per Hour: \$46.13

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Effective Period: 5/14/2014 - 6/30/2014

Wage Rate per Hour: \$53.00

Supplemental Benefit Rate per Hour: \$47.54

Electrician "A" (Regular Day Overtime)

Effective Period: 7/1/2013 - 5/13/2014

Wage Rate per Hour: \$78.00

Supplemental Benefit Rate per Hour: \$49.39

Effective Period: 5/14/2014 - 6/30/2014

Wage Rate per Hour: \$79.50

Supplemental Benefit Rate per Hour: \$50.86

Electrician "A" (Day Shift)

Effective Period: 7/1/2013 - 5/13/2014

Wage Rate per Hour: \$52.00

Supplemental Benefit Rate per Hour: \$46.13

Effective Period: 5/14/2014 - 6/30/2014

Wage Rate per Hour: \$53.00

Supplemental Benefit Rate per Hour: \$47.54

Electrician "A" (Day Shift Overtime After 8 hours)

Effective Period: 7/1/2013 - 5/13/2014

Wage Rate per Hour: \$78.00

Supplemental Benefit Rate per Hour: \$49.39

Effective Period: 5/14/2014 - 6/30/2014

Wage Rate per Hour: \$79.50

Supplemental Benefit Rate per Hour: \$50.86

Electrician "A" (Swing Shift)

Effective Period: 7/1/2013 - 5/13/2014

Wage Rate per Hour: \$61.01

Supplemental Benefit Rate per Hour: \$52.47

Effective Period: 5/14/2014 - 6/30/2014

Wage Rate per Hour: \$62.19

Supplemental Benefit Rate per Hour: \$54.07

Electrician "A" (Swing Shift Overtime After 7.5 hours)

Effective Period: 7/1/2013 - 5/13/2014

Wage Rate per Hour: \$91.52

Supplemental Benefit Rate per Hour: \$56.30

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Effective Period: 5/14/2014 - 6/30/2014

Wage Rate per Hour: \$93.29

Supplemental Benefit Rate per Hour: \$57.97

Electrician "A" (Graveyard Shift)

Effective Period: 7/1/2013 - 5/13/2014

Wage Rate per Hour: \$68.34

Supplemental Benefit Rate per Hour: \$57.83

Effective Period: 5/14/2014 - 6/30/2014

Wage Rate per Hour: \$69.66

Supplemental Benefit Rate per Hour: \$59.59

Electrician "A" (Graveyard Shift Overtime After 7 hours)

Effective Period: 7/1/2013 - 5/13/2014

Wage Rate per Hour: \$102.51

Supplemental Benefit Rate per Hour: \$62.11

Effective Period: 5/14/2014 - 6/30/2014

Wage Rate per Hour: \$104.49

Supplemental Benefit Rate per Hour: \$63.96

Overtime

Time and one half the regular rate after a 7 hour day.

Time and one half the regular rate for Saturday.

Time and one half the regular rate for Sunday.

Overtime Holidays

Time and one half the regular rate for work on a holiday.

New Year's Day

Martin Luther King Jr. Day

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Veteran's Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

Paid Holidays

None

Shift Rates

When so elected by the Employer, one or more shifts of at least five days duration may be scheduled as follows:

Day Shift: 8:00 am to 4:30 pm, Swing Shift 4:30 pm to 12:30 am, Graveyard Shift: 12:30 am to 8:00 am.

For multiple shifts of temporary light and/or power, the temporary light and/or power employee shall be paid for 8 hours at the straight time rate.

Electrician "M" (First 8 hours)

"M" rated work shall be defined as jobbing: electrical work of limited duration and scope, also consisting of repairs and/or replacement of electrical and tele-data equipment. Includes all work necessary to retrofit, service, maintain and repair all kinds of lighting fixtures and local lighting controls and washing and cleaning of foregoing fixtures.

Effective Period: 7/1/2013 - 5/13/2014

Wage Rate per Hour: **\$26.50**

Supplemental Benefit Rate per Hour: **\$19.56**

First and Second Year "M" Wage Rate Per Hour - Hired on or before 5/10/07: **\$25.80**

First and Second Year "M" Supplemental Rate- Hired on or before 5/10/07: **\$19.21**

First and Second Year "M" Wage Rate Per Hour - Hired after 5/10/07: **\$22.00**

First and Second Year "M" Supplemental Rate- Hired after 5/10/07: **\$17.30**

Effective Period: 5/14/2014 - 6/30/2014

Wage Rate per Hour: **\$27.00**

Supplemental Benefit Rate per Hour: **\$20.32**

First and Second Year "M" Wage Rate Per Hour - Hired on or before 5/10/07: **\$26.30**

First and Second Year "M" Supplemental Rate- Hired on or before 5/10/07: **\$19.96**

First and Second Year "M" Wage Rate Per Hour - Hired after 5/10/07: **\$22.50**

First and Second Year "M" Supplemental Rate- Hired after 5/10/07: **\$18.06**

Electrician "M" (Overtime After First 8 hours)

"M" rated work shall be defined as jobbing: electrical work of limited duration and scope, also consisting of repairs and/or replacement of electrical and tele-data equipment. Includes all work necessary to retrofit, service, maintain and repair all kinds of lighting fixtures and local lighting controls and washing and cleaning of foregoing fixtures.

Effective Period: 7/1/2013 - 5/13/2014

Wage Rate per Hour: **\$39.75**

Supplemental Benefit Rate per Hour: **\$21.23**

First and Second Year "M" Wage Rate Per Hour - Hired on or before 5/10/07: **\$38.70**

First and Second Year "M" Supplemental Rate- Hired on or before 5/10/07: **\$20.83**

First and Second Year "M" Wage Rate Per Hour - Hired after 5/10/07: **\$33.00**

First and Second Year "M" Supplemental Rate- Hired after 5/10/07: **\$18.68**

Effective Period: 5/14/2014 - 6/30/2014

Wage Rate per Hour: **\$40.50**

Supplemental Benefit Rate per Hour: **\$21.01**

First and Second Year "M" Wage Rate Per Hour - Hired on or before 5/10/07: **\$39.45**

First and Second Year "M" Supplemental Rate- Hired on or before 5/10/07: **\$21.61**

First and Second Year "M" Wage Rate Per Hour - Hired after 5/10/07: **\$33.75**

First and Second Year "M" Supplemental Rate- Hired after 5/10/07: **\$19.47**

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

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Time and one half the regular rate for Sunday.

Overtime Holidays

Time and one half the regular rate for work on the following holiday(s).

New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays

None

(Local #3)

ELECTRICIAN - ALARM TECHNICIAN

(Scope of Work - Inspect, test, repair, and replace defective, malfunctioning, or broken devices, components and controls of Fire, Burglar and Security Systems)

Alarm Technician

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$30.40

Supplemental Benefit Rate per Hour: \$13.90

Supplemental Note: \$12.40 only after 8 hours worked in a day

Overtime Description

Time and one half the regular rate for work on the following holidays: Columbus Day, Veterans Day, Day after Thanksgiving.

Double time the regular rate for work on the following holidays: New Year's day, Martin Luther King Jr. Day, President's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas Day.

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Paid Holidays

New Year's Day
Martin Luther King Jr. Day

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President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Shift Rates

Night Differential is based upon a ten percent (10%) differential between the hours of 4:00 P.M. and 12:30 A.M. and a fifteen percent (15%) differential for the hours 12:00 A.M. to 8:00 A.M.

Vacation

At least 1 year of employment.....ten (10) days
5 years or more of employment.....fifteen (15) days
10 years of employment.....twenty (20) days
Plus one Personal Day per year

Sick Days:
One day per Year

(Local #3)

ELECTRICIAN-STREET LIGHTING WORKER

Electrician - Electro Pole Electrician

Effective Period: 7/1/2013 - 5/20/2014
Wage Rate per Hour: **\$52.00**
Supplemental Benefit Rate per Hour: **\$47.90**

Effective Period: 5/21/2014 - 6/30/2014
Wage Rate per Hour: **\$53.00**
Supplemental Benefit Rate per Hour: **\$49.34**

Electrician - Electro Pole Foundation Installer

Effective Period: 7/1/2013 - 5/20/2014
Wage Rate per Hour: **\$39.42**
Supplemental Benefit Rate per Hour: **\$36.46**

Effective Period: 5/21/2014 - 6/30/2014
Wage Rate per Hour: **\$40.18**
Supplemental Benefit Rate per Hour: **\$37.73**

Electrician - Electro Pole Maintainer

Effective Period: 7/1/2013 - 5/20/2014

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Wage Rate per Hour: \$33.75

Supplemental Benefit Rate per Hour: \$32.83

Effective Period: 5/21/2014 - 6/30/2014

Wage Rate per Hour: \$34.40

Supplemental Benefit Rate per Hour: \$34.00

Overtime Description

Electrician - Electro Pole Electrician: Time and one half the regular rate after a 7 hour day and after 5 consecutive days worked per week.

Electrician - Electro Pole Foundation Installer: Time and one half the regular rate after 8 hours within a 24 hour period and Saturday and Sunday.

Electrician - Electro Pole Maintainer: Time and one half the regular rate after a 7 hour day and after 5 consecutive days worked per week. Saturdays and Sundays may be used as a make-up day at straight time when a day is lost during the week to inclement weather.

Overtime Holidays

Time and one half the regular rate for work on the following holiday(s).

New Year's Day

Martin Luther King Jr. Day

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Veteran's Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

Paid Holidays

None

(Local #3)

ELEVATOR CONSTRUCTOR

Elevator Constructor

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$57.01

Supplemental Benefit Rate per Hour: \$34.48

Overtime Description

For New Construction: work performed after 7 or 8 hour day, Saturday, Sunday or between 4:30pm and 7:00am shall be paid at double time rate.

Existing buildings: work performed after an 8 hour day, Saturday, Sunday or between 5:30pm and 7:00 am shall be paid time and one half.

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Overtime

Double time the regular rate for work on the following holiday(s).

Paid Holidays

New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Vacation

Employer contributes 8% of regular basic hourly rate as vacation pay for employees with more than 15 years of service, and 6% for employees with 5 to 15 years of service, and 4% for employees with less than 5 years of service.

(Local #1)

ELEVATOR REPAIR & MAINTENANCE

Elevator Service/Modernization Mechanic

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$45.14

Supplemental Benefit Rate per Hour: \$33.02

Overtime Description

For Service Work: Double time - all work performed on Sundays, Holidays, and between midnight and 7:00am.

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Time and one half the regular rate for Sunday.

Time and one half the regular rate for work on a holiday plus the day's pay.

Paid Holidays

New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day

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Thanksgiving Day
Day after Thanksgiving
Christmas Day

Shift Rates

For Modernization Work (4pm to 12:30am) - regularly hourly rate plus a (15%) fifteen percent differential.

Vacation

Employer contributes 8% of regular basic hourly rate as vacation pay for employees with more than 15 years of service, and 6% for employees with 5 to 15 years of service, and 4% for employees with less than 5 years of service.

(Local #1)

ENGINEER

Engineer - Heavy Construction Operating Engineer I

Cherry pickers 20 tons and over and Loaders (rubber tired and/or tractor type with a manufacturer's minimum rated capacity of six cubic yards and over).

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$61.05

Supplemental Benefit Rate per Hour: \$31.93

Supplemental Note: \$57.46 on overtime

Shift Wage Rate: \$97.68

Engineer - Heavy Construction Operating Engineer II

Backhoes, Basin Machines, Groover, Mechanical Sweepers, Bobcat, Boom Truck, Barrier Transport (Barrier Mover) & machines of similar nature. Operation of Churn Drills and machines of a similar nature, Stetco Silent Hoist and machines of similar nature, Vac-Alls, Meyers Machines, John Beam and machines of a similar nature, Ross Carriers and Travel Lifts and machines of a similar nature, Bulldozers, Scrapers and Turn-a-Pulls: Tugger Hoists (Used exclusively for handling excavated material); Tractors with attachments, Hyster and Roustabout Cranes, Cherry pickers. Austin Western, Grove and machines of a similar nature, Scoopmobiles, Monorails, Conveyors, Trenchers: Loaders-Rubber Tired and Tractor: Barber Greene and Eimco Loaders and Eimco Backhoes; Mighty Midget and similar breakers and Tampers, Curb and Gutter Pavers and Motor Patrol, Motor Graders and all machines of a similar nature. Locomotives 10 Tons or under. Mini-Max, Break-Tech and machines of a similar nature; Milling machines, robotic and demolition machines and machines of a similar nature, shot blaster, skid steer machines and machines of a similar nature including bobcat, pile rig rubber-tired excavator (37,000 lbs. and under), 2 man auger.

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$59.24

Supplemental Benefit Rate per Hour: \$31.93

Supplemental Note: \$57.46 on overtime

Shift Wage Rate: \$94.78

Engineer - Heavy Construction Operating Engineer III

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Minor Equipment such as Tractors, Post Hole Diggers, Ditch Witch (Walk Behind), Road Finishing Machines, Rollers five tons and under, Tugger Hoists, Dual Purpose Trucks, Fork Lifts, and Dempsey Dumpers, Fireperson.

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$56.22

Supplemental Benefit Rate per Hour: \$31.93

Supplemental Note: \$57.46 on overtime

Shift Wage Rate: \$89.95

Engineer - Heavy Construction Maintenance Engineer I

Installing, Repairing, Maintaining, Dismantling and Manning of all equipment including Steel Cutting, Bending and Heat Sealing Machines, Mechanical Heaters, Grout Pumps, Bentonite Pumps & Plants, Screening Machines, Fusion Coupling Machines, Tunnel Boring Machines Moles and Machines of a similar nature, Power Packs, Mechanical Hydraulic Jacks; all drill rigs including but not limited to Churn, Rotary Caisson, Raised Bore & Drills of a similar nature; Personnel, Inspection & Safety Boats or any boats used to perform functions of same, Mine Hoists, Whirlies, all Climbing Cranes, all Tower Cranes, including but not limited to Truck Mounted and Crawler Type and machines of similar nature; Maintaining Hydraulic Drills and machines of a similar nature; Well Point System-Installation and dismantling; Burning, Welding, all Pumps regardless of size and/or motor power, except River Cofferdam Pumps and Wells Point Pumps; Motorized Buggies (three or more); equipment used in the cleaning and televising of sewers, but not limited to jet-rodder/vacuum truck, vacall/vactor, closed circuit television inspection equipment; high powered water pumps, jet pumps; screed machines and concrete finishing machines of a similar nature; vermeers.

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$58.97

Supplemental Benefit Rate per Hour: \$31.93

Supplemental Note: \$57.46 on overtime

Shift Wage Rate: \$94.35

Engineer - Heavy Construction Maintenance Engineer II

On Base Mounted Tower Cranes

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$77.30

Supplemental Benefit Rate per Hour: \$31.93

Supplemental Note: \$57.46 on overtime

Shift Wage Rate: \$123.68

Engineer - Heavy Construction Maintenance Engineer III

On Generators, Light Towers

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$39.10

Supplemental Benefit Rate per Hour: \$31.93

Supplemental Note: \$57.46 on overtime

Shift Wage Rate: \$62.56

Engineer - Heavy Construction Maintenance Engineer IV

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
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On Pumps and Mixers including mud sucking

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$40.11

Supplemental Benefit Rate per Hour: \$31.93

Supplemental Note: \$57.46 on overtime

Shift Wage Rate: \$64.18

Engineer - Heavy Construction Oilers I

Gradalls, Cold Planer Grader, Concrete Pumps, Driving Truck Cranes, Driving and Operating Fuel and Grease Trucks.

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$53.22

Supplemental Benefit Rate per Hour: \$31.93

Supplemental Note: \$57.46 on overtime

Shift Wage Rate: \$85.15

Engineer - Heavy Construction Oilers II

All gasoline, electric, diesel or air operated Shovels, Draglines, Backhoes, Keystones, Pavers, Gunite Machines, Battery of Compressors, Crawler Cranes, two-person Trenching Machines.

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$36.97

Supplemental Benefit Rate per Hour: \$31.93

Supplemental Note: \$57.46 on overtime

Shift Wage Rate: \$59.15

Engineer - Steel Erection Maintenance Engineers

Derrick, Travelers, Tower, Crawler Tower and Climbing Cranes

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$57.05

Supplemental Benefit Rate per Hour: \$31.93

Supplemental Note: \$57.46 on overtime

Shift Wage Rate: \$91.28

Engineer - Steel Erection Oiler I

On a Truck Crane

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$53.43

Supplemental Benefit Rate per Hour: \$31.93

Supplemental Note: \$57.46 on overtime

Shift Wage Rate: \$85.49

Engineer - Steel Erection Oiler II

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 PREVAILING WAGE SCHEDULE

On a Crawler Crane

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: **\$40.84**

Supplemental Benefit Rate per Hour: **\$31.93**

Supplemental Note: **\$57.46** on overtime

Shift Wage Rate: **\$65.34**

Overtime Description

On jobs of more than one shift, if the next shift employee fails to report for work through any cause over which the employer has no control, the employee on duty who works the next shift continues to work at the single time rate.

Overtime

Double time the regular rate after an 8 hour day.

Double time the regular time rate for Saturday.

Double time the regular rate for Sunday.

Double time the regular rate for work on the following holiday(s).

Paid Holidays

New Year's Day

Lincoln's Birthday

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Veteran's Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

Employees must work at least one day in the payroll week in which the holiday occurs to receive the paid holiday

Engineer - Building Work Maintenance Engineers I

Installing, repairing, maintaining, dismantling (of all equipment including: Steel Cutting and Bending Machines, Mechanical Heaters, Mine Hoists, Climbing Cranes, Tower Cranes, Linden Peine, Lorain, Liebherr, Mannes, or machines of a similar nature, Well Point Systems, Deep Well Pumps, Concrete Mixers with loading Device, Concrete Plants, Motor Generators when used for temporary power and lights), skid steer machines of a similar nature including bobcat.

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: **\$54.04**

Supplemental Benefit Rate per Hour: **\$31.93**

Supplemental Note: **\$57.46** on overtime

Engineer - Building Work Maintenance Engineers II

On Pumps, Generators, Mixers and Heaters

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
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Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$42.10

Supplemental Benefit Rate per Hour: \$31.93

Supplemental Note: \$57.46 on overtime

Engineer - Building Work Oilers I

All gasoline, electric, diesel or air operated Gradealls: Concrete Pumps, Overhead Cranes in Power Houses: Their duties shall be to assist the Engineer in oiling, greasing and repairing of all machines; Driving Truck Cranes: Driving and Operating Fuel and Grease Trucks, Cherrypickers (hydraulic cranes) over 70,000 GVW, and machines of a similar nature.

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$51.40

Supplemental Benefit Rate per Hour: \$31.93

Supplemental Note: \$57.46 on overtime

Engineer - Building Work Oilers II

Oilers on Crawler Cranes, Backhoes, Trenching Machines, Gunite Machines, Compressors (three or more in Battery).

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$38.31

Supplemental Benefit Rate per Hour: \$31.93

Supplemental Note: \$57.46 on overtime

Overtime Description

On jobs of more than one shift, if an Employee fails to report for work through any cause over which the Employer has no control, the Employee on duty will continue to work at the rate of single time.

Overtime

Double time the regular rate after an 8 hour day.

Double time the regular time rate for Saturday.

Double time the regular rate for Sunday.

Double time the regular rate for work on the following holiday(s).

Paid Holidays

New Year's Day

Lincoln's Birthday

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Veteran's Day

Thanksgiving Day

Christmas Day

Employees must work at least one day in the payroll week in which the holiday occurs to receive the paid holiday

Shift Rates

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 PREVAILING WAGE SCHEDULE

Off Shift: double time the regular hourly rate.

(Local #15)

ENGINEER - CITY SURVEYOR AND CONSULTANT

Party Chief

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: **\$35.55**

Supplemental Benefit Rate per Hour: **\$17.65**

Instrument Person

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: **\$29.41**

Supplemental Benefit Rate per Hour: **\$17.65**

Rodperson

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: **\$25.54**

Supplemental Benefit Rate per Hour: **\$17.65**

Overtime Description

Overtime Benefit Rate - \$23.63 per hour (time & one half) \$29.95 per hour (double time).

Time and one half the regular rate after an 8 hour day, Time and one half the regular rate for Saturday for the first eight hours worked, Double time the regular time rate for Saturday for work performed in excess of eight hours, Double time the regular rate for Sunday and Double time the regular rate for work on a holiday.

Paid Holidays

New Year's Day

Lincoln's Birthday

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Veteran's Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

Employees must work at least one day in the payroll week in which the holiday occurs to receive the paid holiday

(Operating Engineer Local #15-D)

ENGINEER - FIELD (BUILDING CONSTRUCTION)
(Construction of Building Projects, Concrete Superstructures, etc.)

Field Engineer - BC Party Chief

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$55.40

Supplemental Benefit Rate per Hour: \$30.62

Supplemental Note: Overtime Benefit Rate - \$42.73 per hour (time & one half) \$54.84 per hour (double time).

Field Engineer - BC Instrument Person

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$43.10

Supplemental Benefit Rate per Hour: \$30.62

Supplemental Note: Overtime Benefit Rate - \$42.73 per hour (time & one half) \$54.84 per hour (double time).

Field Engineer - BC Rodperson

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$27.96

Supplemental Benefit Rate per Hour: \$30.62

Supplemental Note: Overtime Benefit Rate - \$42.73 per hour (time & one half) \$54.84 per hour (double time).

Overtime Description

Time and one half the regular rate after a 7 hour work and time and one half the regular rate for Saturday for the first seven hours worked, Double time the regular time rate for Saturday for work performed in excess of seven hours, Double time the regular rate for Sunday and Double time the regular rate for work on a holiday.

Paid Holidays

New Year's Day

President's Day

Good Friday

Memorial Day

Independence Day

Labor Day

Columbus Day

Veteran's Day

Thanksgiving Day

Christmas Day

Employees must work at least one day in the payroll week in which the holiday occurs to receive the paid holiday

(Operating Engineer Local #15-D)

ENGINEER - FIELD (HEAVY CONSTRUCTION)
(Construction of Roads, Tunnels, Bridges, Sewers, Building Foundations, Engineering Structures etc.)

Field Engineer - HC Party Chief

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$62.61

Supplemental Benefit Rate per Hour: \$30.62

Supplemental Note: Overtime benefit rate - \$42.73 per hour (time & one half), \$54.84 per hour (double time).

Field Engineer - HC Instrument Person

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$46.00

Supplemental Benefit Rate per Hour: \$30.62

Supplemental Note: Overtime benefit rate - \$42.73 per hour (time & one half), \$54.84 per hour (double time).

Field Engineer - HC Rodperson

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$38.61

Supplemental Benefit Rate per Hour: \$30.62

Supplemental Note: Overtime benefit rate - \$42.73 per hour (time & one half), \$54.84 per hour (double time).

Overtime Description

Time and one half the regular rate after an 8 hour day, Time and one half the regular rate for Saturday for the first eight hours worked, Double time the regular time rate for Saturday for work performed in excess of eight hours, Double time the regular rate for Sunday and Double time the regular rate for work on a holiday.

Paid Holidays

New Year's Day

Lincoln's Birthday

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Veteran's Day

Thanksgiving Day

Christmas Day

Employees must work at least one day in the payroll week in which the holiday occurs to receive the paid holiday

(Operating Engineer Local #15-D)

ENGINEER - FIELD (STEEL ERECTION)

Field Engineer - Steel Erection Party Chief

Effective Period: 7/1/2013 - 6/30/2014

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Wage Rate per Hour: **\$58.50**

Supplemental Benefit Rate per Hour: **\$30.62**

Supplemental Note: Overtime benefit rate - \$42.73 per hour (time & one half), \$54.84 per hour (double time).

Field Engineer - Steel Erection Instrument Person

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: **\$45.53**

Supplemental Benefit Rate per Hour: **\$30.62**

Supplemental Note: Overtime benefit rate - \$42.73 per hour (time & one half), \$54.84 per hour (double time).

Field Engineer - Steel Erection Rodperson

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: **\$30.43**

Supplemental Benefit Rate per Hour: **\$30.62**

Supplemental Note: Overtime benefit rate - \$42.73 per hour (time & one half), \$54.84 per hour (double time).

Overtime Description

Time and one half the regular rate for Saturday for the first eight hours worked.

Double time the regular rate for Saturday for work performed in excess of eight hours.

Overtime

Time and one half the regular rate after an 8 hour day.

Double time the regular rate for Sunday.

Double time the regular rate for work on the following holiday(s).

Paid Holidays

New Year's Day

Lincoln's Birthday

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Veteran's Day

Thanksgiving Day

Christmas Day

Employees must work at least one day in the payroll week in which the holiday occurs to receive the paid holiday

(Operating Engineer Local #15-D)

ENGINEER - OPERATING

Operating Engineer - Road & Heavy Construction I

Back Filling Machines, Cranes, Mucking Machines and Dual Drum Paver.

Effective Period: 7/1/2013 - 6/30/2014

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Wage Rate per Hour: **\$67.70**
Supplemental Benefit Rate per Hour: **\$28.60**
Supplemental Note: **\$51.75** overtime hours
Shift Wage Rate: **\$108.32**

Operating Engineer - Road & Heavy Construction II

Backhoes, Power Shovels, Hydraulic Clam Shells, Steel Erection, Moles and machines of a similar nature.

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: **\$70.10**
Supplemental Benefit Rate per Hour: **\$28.60**
Supplemental Note: **51.75** overtime hours
Shift Wage Rate: **\$112.16**

Operating Engineer - Road & Heavy Construction III

Mine Hoists, Cranes, etc. (Used as Mine Hoists)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: **\$72.34**
Supplemental Benefit Rate per Hour: **\$28.60**
Supplemental Note: **\$51.75** overtime hours
Shift Wage Rate: **\$115.74**

Operating Engineer - Road & Heavy Construction IV

Gradealls, Keystones, Cranes on land or water (with digging buckets), Bridge Cranes, Vermeer Cutter and machines of a similar nature, Trenching Machines.

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: **\$70.63**
Supplemental Benefit Rate per Hour: **\$28.60**
Supplemental Note: **\$51.75** overtime hours
Shift Wage Rate: **\$113.01**

Operating Engineer - Road & Heavy Construction V

Pile Drivers & Rigs (employing Dock Builder foreperson): Derrick Boats, Tunnel Shovels.

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: **\$69.23**
Supplemental Benefit Rate per Hour: **\$28.60**
Supplemental Note: **\$51.75** overtime hours
Shift Wage Rate: **\$110.77**

Operating Engineer - Road & Heavy Construction VI

Mixers (Concrete with loading attachment), Concrete Pavers, Cableways, Land Derricks, Power Houses (Low Air Pressure Units).

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Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$65.76
Supplemental Benefit Rate per Hour: \$28.60
Supplemental Note: \$51.75 overtime hours
Shift Wage Rate: \$105.22

Operating Engineer - Road & Heavy Construction VII

Barrier Movers , Barrier Transport and Machines of a Similar Nature.

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$53.08
Supplemental Benefit Rate per Hour: \$28.60
Supplemental Note: \$51.75 overtime hours
Shift Wage Rate: \$84.93

Operating Engineer - Road & Heavy Construction VIII

Utility Compressors

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$41.18
Supplemental Benefit Rate per Hour: \$28.60
Supplemental Note: \$51.75 overtime hours
Shift Wage Rate: \$51.93

Operating Engineer - Road & Heavy Construction IX

Horizontal Boring Rig

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$62.53
Supplemental Benefit Rate per Hour: \$28.60
Supplemental Note: \$51.75 overtime hours
Shift Wage Rate: \$100.05

Operating Engineer - Road & Heavy Construction X

Elevators (manually operated as personnel hoist).

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$57.46
Supplemental Benefit Rate per Hour: \$28.60
Supplemental Note: \$51.75 overtime hours
Shift Wage Rate: \$91.94

Operating Engineer - Road & Heavy Construction XI

Compressors (Portable 3 or more in battery), Driving of Truck Mounted Compressors, Well-point Pumps, Tugger Machines Well Point Pumps, Churn Drill.

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Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$44.63
Supplemental Benefit Rate per Hour: \$28.60
Supplemental Note: \$51.75 overtime hours
Shift Wage Rate: \$71.41

Operating Engineer - Road & Heavy Construction XII

All Drills and Machines of a similar nature.

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$66.45
Supplemental Benefit Rate per Hour: \$28.60
Supplemental Note: \$51.75 overtime hours
Shift Wage Rate: \$106.32

Operating Engineer - Road & Heavy Construction XIII

Concrete Pumps, Concrete Plant, Stone Crushers, Double Drum Hoist, Power Houses (other than above).

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$64.34
Supplemental Benefit Rate per Hour: \$28.60
Supplemental Note: \$51.75 overtime hours
Shift Wage Rate: \$102.94

Operating Engineer - Road & Heavy Construction XIV

Concrete Mixer

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$61.53
Supplemental Benefit Rate per Hour: \$28.60
Supplemental Note: \$51.75 overtime hours
Shift Wage Rate: \$98.45

Operating Engineer - Road & Heavy Construction XV

Compressors (Portable Single or two in Battery, not over 100 feet apart), Pumps (River Cofferdam) and Welding Machines, Push Button Machines, All Engines Irrespective of Power (Power-Pac) used to drive auxiliary equipment, Air, Hydraulic, etc.

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$41.44
Supplemental Benefit Rate per Hour: \$28.60
Supplemental Note: \$51.75 overtime hours
Shift Wage Rate: \$66.30

Operating Engineer - Road & Heavy Construction XVI

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Concrete Breaking Machines, Hoists (Single Drum), Load Masters, Locomotives (over ten tons) and Dinkies over ten tons, Hydraulic Crane-Second Engineer.

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$58.74

Supplemental Benefit Rate per Hour: \$28.60

Supplemental Note: \$51.85 overtime hours

Shift Wage Rate: \$93.98

Operating Engineer - Road & Heavy Construction XVII

On-Site concrete plant engineer, On-site Asphalt Plant Engineer, and Vibratory console.

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$59.21

Supplemental Benefit Rate per Hour: \$28.60

Supplemental Note: \$51.75 overtime hours

Shift Wage Rate: \$94.74

Operating Engineer - Road & Heavy Construction XVIII

Tower Crane

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$85.00

Supplemental Benefit Rate per Hour: \$28.60

Supplemental Note: \$51.75 overtime hours

Shift Wage Rate: \$136.00

Operating Engineer - Paving I

Asphalt Spreaders, Autogrades (C.M.I.), Roto/Mil

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$65.76

Supplemental Benefit Rate per Hour: \$28.60

Supplemental Note: \$51.75 overtime hours

Shift Wage Rate: \$105.22

Operating Engineer - Paving II

Asphalt Roller

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$64.04

Supplemental Benefit Rate per Hour: \$28.60

Supplemental Note: \$51.75 overtime hours

Shift Wage Rate: \$102.46

Operating Engineer - Paving III

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Asphalt Plants

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$54.17

Supplemental Benefit Rate per Hour: \$28.60

Supplemental Note: \$51.75 overtime hours

Shift Wage Rate: \$86.67

Operating Engineer - Concrete I

Cranes

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$70.32

Supplemental Benefit Rate per Hour: \$28.60

Supplemental Note: \$51.75 overtime hours

Operating Engineer - Concrete II

Compressors

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$41.76

Supplemental Benefit Rate per Hour: \$28.60

Supplemental Note: \$51.75 overtime hours

Operating Engineer - Concrete III

Micro-traps (Negative Air Machines), Vac-All Remediation System.

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$56.16

Supplemental Benefit Rate per Hour: \$28.60

Supplemental Note: \$51.75 overtime hours

Operating Engineer - Steel Erection I

Three Drum Derricks

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$73.37

Supplemental Benefit Rate per Hour: \$28.60

Supplemental Note: \$51.75 overtime hours

Shift Wage Rate: \$117.39

Operating Engineer - Steel Erection II

Cranes, 2 Drum Derricks, Hydraulic Cranes, Fork Lifts and Boom Trucks.

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$70.50

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Supplemental Benefit Rate per Hour: **\$28.60**
Supplemental Note: \$51.75 overtime hours
Shift Wage Rate: **\$112.80**

Operating Engineer - Steel Erection III

Compressors, Welding Machines.

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: **\$41.84**
Supplemental Benefit Rate per Hour: **\$28.60**
Supplemental Note: \$51.75 overtime hours
Shift Wage Rate: **\$66.94**

Operating Engineer - Steel Erection IV

Compressors - Not Combined with Welding Machine.

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: **\$39.85**
Supplemental Benefit Rate per Hour: **\$28.60**
Supplemental Note: \$51.75 overtime hours
Shift Wage Rate: **\$63.76**

Operating Engineer - Building Work I

Forklifts, Plaster (Platform machine), Plaster Bucket, Concrete Pump and all other equipment used for hoisting material.

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: **\$57.82**
Supplemental Benefit Rate per Hour: **\$28.60**
Supplemental Note: \$51.75 overtime hours

Operating Engineer - Building Work II

Compressors, Welding Machines (Cutting Concrete-Tank Work), Paint Spraying, Sandblasting, Pumps (with the exclusion of Concrete Pumps), All Engines irrespective of Power (Power-Pac) used to drive Auxiliary Equipment, Air, Hydraulic, Jacking System, etc.

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: **\$43.28**
Supplemental Benefit Rate per Hour: **\$28.60**
Supplemental Note: \$51.75 overtime hours

Operating Engineer - Building Work III

Double Drum

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: **\$65.83**

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Supplemental Benefit Rate per Hour: \$28.60
Supplemental Note: \$51.75 overtime hours

Operating Engineer - Building Work IV

Stone Derrick, Cranes, Hydraulic Cranes Boom Trucks.

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$69.74
Supplemental Benefit Rate per Hour: \$28.60
Supplemental Note: \$51.75 overtime hours

Operating Engineer - Building Work V

Dismantling and Erection of Cranes, Relief Engineer.

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$64.26
Supplemental Benefit Rate per Hour: \$28.60
Supplemental Note: \$51.75 overtime hours

Operating Engineer - Building Work VI

4 Pole Hoist, Single Drum Hoists.

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$63.58
Supplemental Benefit Rate per Hour: \$28.60
Supplemental Note: \$51.75 overtime hours

Operating Engineer - Building Work VII

Rack & Pinion and House Cars

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$50.53
Supplemental Benefit Rate per Hour: \$28.60
Supplemental Note: \$51.75 overtime hours
For New House Car projects started after 7/1/11 only: Wage Rate per Hour \$40.31

Overtime Description

On jobs of more than one shift, if an Employee fails to report for work through any cause over which the Employer has no control, the Employee on duty will continue to work at the rate of single time.

For House Cars and Rack & Pinion only: Overtime paid at time and one-half for all hours in excess of eight hours in a day, Saturday, Sunday and Holidays worked.

Overtime

Double time the regular rate after an 8 hour day.
Double time the regular time rate for Saturday.
Double time the regular rate for Sunday.
Double time the regular rate for work on the following holiday(s).

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Paid Holidays

New Year's Day
Lincoln's Birthday
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Employees must work at least one day in the payroll week in which the holiday occurs to receive the paid holiday

Shift Rates

For Steel Erection Only: Shifts may be worked at the single time rate at other than the regular working hours (8:00 A.M. to 4:30 P.M.) on the following work ONLY: Heavy construction jobs on work below the street level, over railroad tracks and on building jobs.

(Operating Engineer Local #14)

FLOOR COVERER

(Interior vinyl composition tile, sheath vinyl linoleum and wood parquet tile including site preparation and synthetic turf not including site preparation)

Floor Coverer

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: **\$46.15**

Supplemental Benefit Rate per Hour: **\$38.50**

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Day after Thanksgiving

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Christmas Day

Paid Holidays

1/2 day on Christmas Eve if work is performed in the A.M.
1/2 day on New Year's Eve if work is performed in the A.M.

Shift Rates

Two shifts may be utilized with the first shift working 8:00 A.M. to the end of the shift at the straight time of pay. The second shift will receive one hour at double time rate for the last hour of the shift. (eight for seven, nine for eight).

(Carpenters District Council)

GLAZIER
(New Construction, Remodeling, and Alteration)

Glazier

Effective Period: 7/1/2013 - 10/31/2013

Wage Rate per Hour: **\$42.00**

Supplemental Benefit Rate per Hour: **\$33.24**

Supplemental Note: Supplemental Benefit Overtime Rate: **\$41.24**

Effective Period: 11/1/2013 - 6/30/2014

Wage Rate per Hour: **\$42.00**

Supplemental Benefit Rate per Hour: **\$34.09**

Supplemental Note: Supplemental Benefit Overtime Rate: **\$42.59**

Overtime Description

An optional 8th hour can be worked at straight time rate. If 9th hour is worked, then both hours or more (8th & 9th or more) will be at the double time rate of pay.

Overtime

Double time the regular rate after a 7 hour day.

Double time the regular time rate for Saturday.

Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

President's Day

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 PREVAILING WAGE SCHEDULE

Paid Holidays

None

Shift Rates

Shifts shall be any 7 hours beyond 4:00 P.M. for which the glazier shall receive 8 hours pay for 7 hours worked.

(Local #1281)

GLAZIER - REPAIR & MAINTENANCE

(For the Installation of Glass - All repair and maintenance work on a particular building, whenever performed, where the total cumulative contract value is under \$105,000. Except where enumerated (i.e. plate glass windows) does not apply to non-residential buildings.)

Craft Jurisdiction for repair, maintenance and fabrication

Plate glass replacement, Residential glass replacement, Residential mirrors and shower doors, Storm windows and storm doors, Residential replacement windows, Herculite door repairs, Door closer repairs, Retrofit apartment house (non commercial buildings), Glass tinting.

Effective Period: 7/1/2013 - 4/30/2014

Wage Rate per Hour: \$23.50

Supplemental Benefit Rate per Hour: \$18.54

Effective Period: 5/1/2014 - 6/30/2014

Wage Rate per Hour: \$23.60

Supplemental Benefit Rate per Hour: \$19.04

Overtime

Time and one half the regular rate after an 8 hour day.

Double time the regular rate for Sunday.

Time and one half the regular hourly rate after 40 hours in any work week.

Paid Holidays

New Year's Day

President's Day

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

(Local #1281)

HEAT AND FROST INSULATOR

Heat & Frost Insulator

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$56.48

Supplemental Benefit Rate per Hour: \$33.31

Overtime Description

Double time shall be paid for supplemental benefits during overtime work.
8th hour paid at time and one half.

Overtime

Double time the regular rate after an 8 hour day.

Double time the regular time rate for Saturday.

Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

Martin Luther King Jr. Day

President's Day

Memorial Day

Independence Day

Columbus Day

Veteran's Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

Triple time the regular rate for work on the following holiday(s).

Labor Day

Paid Holidays

None

Shift Rates

The first shift shall work seven hours at the regular straight time rate. The second and third shift shall work seven hours the regular straight time hourly rate plus a fourteen percent wage and benefit premium.

Off hour work in occupied or retail buildings may be worked on weekdays with an increment of \$1.00 per hour and eight hours pay for seven (7) hours worked. Double time will apply for over seven (7) hours worked on weekdays, weekends or holidays.

(Local #12)

HOUSE WRECKER (TOTAL DEMOLITION)

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 PREVAILING WAGE SCHEDULE

House Wrecker - Tier A

On all work sites the first, second, eleventh and every third House Wrecker thereafter shall be Tier A House Wreckers (i.e. 1st, 2nd, 11th, 14th etc). The 10th and 20th House Wrecker shall be apprentices. Other House Wreckers shall be Tier B House Wreckers.

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$34.01

Supplemental Benefit Rate per Hour: \$25.14

House Wrecker - Tier B

On all work sites the first, second, eleventh and every third House Wrecker thereafter shall be Tier A House Wreckers (i.e. 1st, 2nd, 11th, 14th etc). The 10th and 20th House Wrecker shall be apprentices. Other House Wreckers shall be Tier B House Wreckers.

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$23.75

Supplemental Benefit Rate per Hour: \$18.62

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

President's Day

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Christmas Day

Paid Holidays

None

(Mason Tenders District Council)

IRON WORKER - ORNAMENTAL

Iron Worker - Ornamental

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$42.30

Supplemental Benefit Rate per Hour: \$43.54

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§220 PREVAILING WAGE SCHEDULE

Supplemental Note: Supplemental benefits are to be paid at the applicable overtime rate when overtime is in effect.

Overtime Description

Time and one half the regular rate after a 7 hour day for a maximum of two hours on any regular work day (the 8th and 9th hour) and double time shall be paid for all work on a regular work day thereafter, time and one half the regular rate for Saturday for the first seven hours of work and double time shall be paid for all work on a Saturday thereafter.

Overtime

Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays

None

Shift Rates

For off shift work - 8 hours pay for 7 hours of work. When two or three shifts are employed on a job, Monday through Friday, the workday for each shift shall be seven hours and paid for ten and one-half hours at the single time rate. When two or three shifts are worked on Saturday, Sunday or holidays, each shift shall be seven hours and paid fifteen and three-quarters hours.

(Local #580)

IRON WORKER - STRUCTURAL

Iron Worker - Structural

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$46.75

Supplemental Benefit Rate per Hour: \$62.48

Supplemental Note: Supplemental benefits are to be paid at the applicable overtime rate when overtime is in effect.

Overtime Description

Monday through Friday- the first eight hours are paid at straight time, the 9th and 10th hours are paid at time and one-half the regular rate, all additional weekday overtime is paid at double the regular rate. Saturdays- the first eight hours are paid at time and one-half the regular rate, double time thereafter. Sunday-all shifts are paid at double time.

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
\$220 PREVAILING WAGE SCHEDULE

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays

1/2 day on Christmas Eve if work is performed in the A.M.
1/2 day on New Year's Eve if work is performed in the A.M.

Shift Rates

Monday through Friday - First Shift: First eight hours are paid at straight time, the 9th & 10th hours are paid at time and a half, double time paid thereafter. Second and third Shifts: First eight hours are paid at time and one-half, double time thereafter. Saturdays: All shifts, first eight hours paid at time and one-half, double time thereafter: Sunday all shifts are paid at double time.

(Local #40 & #361)

LABORER

(Foundation, Concrete, Excavating, Street Pipe Layer and Common)

Laborer

Excavation and foundation work for buildings, heavy construction, engineering work, and hazardous waste removal in connection with the above work. Landscaping tasks in connection with heavy construction work, engineering work and building projects. Projects include, but are not limited to pollution plants, sewers, parks, subways, bridges, highways, etc.

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$39.25

Supplemental Benefit Rate per Hour: \$33.25

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

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§220 PREVAILING WAGE SCHEDULE

New Year's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Christmas Day

Paid Holidays

Labor Day
Thanksgiving Day

Shift Rates

When two shifts are employed, single time rate shall be paid for each shift. When three shifts are found necessary, each shift shall work seven and one half hours (7 ½), but shall be paid for eight (8) hours of labor, and be permitted one half hour for lunch.

(Local #731)

LANDSCAPING

(Landscaping tasks, as well as tree pruning, tree removing, spraying and maintenance in connection with the planting of street trees and the planting of trees in city parks but not when such activities are performed as part of, or in connection with, other construction or reconstruction projects.)

Landscaper (Above 6 years experience)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$24.25
Supplemental Benefit Rate per Hour: \$12.30

Landscaper (3 - 6 years experience)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$23.25
Supplemental Benefit Rate per Hour: \$12.30

Landscaper (up to 3 years experience)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$20.75
Supplemental Benefit Rate per Hour: \$12.30

Groundperson

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Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$20.75
Supplemental Benefit Rate per Hour: \$12.30

Tree Remover / Pruner

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$29.25
Supplemental Benefit Rate per Hour: \$12.30

Landscaper Sprayer (Pesticide Applicator)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$19.25
Supplemental Benefit Rate per Hour: \$12.30

Watering - Plant Maintainer

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$14.25
Supplemental Benefit Rate per Hour: \$12.30

Overtime Description

For all overtime work performed, supplemental benefits shall include an additional seventy-five (\$0.75) cents per hour.

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Time and one half the regular rate for work on a holiday plus the day's pay.

Paid Holidays

New Year's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Shift Rates

Work performed on a 4pm to 12am shift has a 15% differential. Work performed on a 12am to 8am shift has a 20% differential.

(Local #175)

MARBLE MECHANIC

Marble Setter

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$49.19
Supplemental Benefit Rate per Hour: \$32.24

Marble Finisher

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$39.05
Supplemental Benefit Rate per Hour: \$31.43

Marble Polisher

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$34.73
Supplemental Benefit Rate per Hour: \$24.60

Overtime Description

Supplemental Benefit contributions are to be made at the applicable overtime rates. Time and one half the regular rate after a 7 hour day or time and one half the regular rate after an 8 hour day - chosen by Employer at the start of the project and then would last for the full duration of the project.

Overtime

Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays

None

(Local #7)

MASON TENDER

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 PREVAILING WAGE SCHEDULE

Mason Tender

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$35.00

Supplemental Benefit Rate per Hour: \$25.74

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

President's Day

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Christmas Day

Paid Holidays

None

Shift Rates

The Employer may work two (2) shifts with the first shift at the straight time wage rate and the second shift receiving eight (8) hours paid for seven (7) hours work at the straight time wage rate.

(Local #79)

MASON TENDER (INTERIOR DEMOLITION WORKER)

(The erection, building, moving, servicing and dismantling of enclosures, scaffolding, barricades, protection and site safety structures etc., on Interior Demolition jobs.)

Mason Tender Tier A

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$34.07

Supplemental Benefit Rate per Hour: \$19.77

Mason Tender Tier B

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§220 PREVAILING WAGE SCHEDULE

On Interior Demolition job sites 33 1/3 % of the employees shall be classified as Tier A Interior Demolition Workers and 66 2/3 % shall be classified as Tier B Interior Demolition Workers; provided that the employer may employ more than 33 1/3 % Tier A Interior Demolition Workers on the job site. Where the number of employees on a job site is not divisible by 3, the first additional employee (above the number of employees divisible by three) shall be a Tier B Interior Demolition Worker, and the second additional employee shall be a Tier A Interior Demolition Worker.

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$23.27

Supplemental Benefit Rate per Hour: \$14.08

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

President's Day

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Christmas Day

Paid Holidays

None

(Local #79)

METALLIC LATHER

Metallic Lather

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$41.43

Supplemental Benefit Rate per Hour: \$40.15

Supplemental Note: Supplemental benefits for overtime are paid at the appropriate overtime rate.

Overtime Description

Overtime would be time and one half the regular rate after a seven (7) or eight (8) hours workday, which would be set at the start of the job.

Overtime

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

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§220 PREVAILING WAGE SCHEDULE

New Year's Day
Washington's Birthday
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Christmas Day

Paid Holidays

1/2 day on Christmas Eve if work is performed in the A.M.
1/2 day on New Year's Eve if work is performed in the A.M.

Shift Rates

There shall be either two (2) or three (3) shifts, each shift shall be eight (8) hours with nine (9) hours pay, including one half (1/2) hour for lunch. Off-Hour Start shall commence after 3:30 P.M. and shall conclude by 6:00 A.M. The first consecutive seven (7) hours shall be at straight time with a differential of twelve dollars (\$12.00) per hour. Fringes shall be paid at the straight time rate.

(Local #46)

MILLWRIGHT

Millwright

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: **\$47.69**

Supplemental Benefit Rate per Hour: **\$48.87**

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Christmas Day

Paid Holidays

1/2 day on Christmas Eve if work is performed in the A.M.
1/2 day on New Year's Eve if work is performed in the A.M.

Shift Rates

The first shift shall receive the straight time rate of pay. The second shift receives the straight time rate of pay plus fifteen (15%) per cent. Members of the second shift shall be allowed one half hour to eat, with this time being included in the hours of the workday established. There must be a first shift to work a second shift. All additional hours worked shall be paid at the time and one-half rate of pay plus fifteen (15%) per cent for weekday hours.

(Local #740)

MOSAIC MECHANIC

Mosaic Mechanic - Mosaic & Terrazzo Mechanic

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$44.39

Supplemental Benefit Rate per Hour: \$35.11

Supplemental Note: Supplemental benefits for overtime to be paid at the rate of \$46.08 per hour.

Mosaic Mechanic - Mosaic & Terrazzo Finisher

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$42.78

Supplemental Benefit Rate per Hour: \$35.11

Supplemental Note: Supplemental benefits for overtime to be paid at the rate of \$46.08 per hour.

Mosaic Mechanic - Machine Operator Grinder

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$42.78

Supplemental Benefit Rate per Hour: \$35.11

Supplemental Note: Supplemental benefits for overtime to be paid at the rate of \$46.08 per hour.

Overtime

Time and one half the regular rate after a 7 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

Washington's Birthday

Good Friday

Independence Day

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§220 PREVAILING WAGE SCHEDULE

Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays

None

(Local #7)

PAINTER

Painter - Brush & Roller

Effective Period: 7/1/2013 - 4/30/2014

Wage Rate per Hour: \$37.50

Supplemental Benefit Rate per Hour: \$25.62

Supplemental Note: \$30.25 on overtime

Effective Period: 5/1/2014 - 6/30/2014

Wage Rate per Hour: \$39.50

Supplemental Benefit Rate per Hour: \$26.12

Supplemental Note: \$30.75 on overtime

Spray & Scaffold / Decorative / Sandblast

Effective Period: 7/1/2013 - 4/30/2014

Wage Rate per Hour: \$40.50

Supplemental Benefit Rate per Hour: \$25.62

Supplemental Note: \$30.25 on overtime

Effective Period: 5/1/2014 - 6/30/2014

Wage Rate per Hour: \$42.50

Supplemental Benefit Rate per Hour: \$26.12

Supplemental Note: \$30.75 on overtime

Overtime

Time and one half the regular rate after a 7 hour day.

Time and one half the regular rate for Saturday.

Time and one half the regular rate for Sunday.

Overtime Holidays

Time and one half the regular rate for work on the following holiday(s).

New Year's Day

President's Day

Memorial Day

Independence Day

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\$220 PREVAILING WAGE SCHEDULE

Labor Day
Columbus Day
Thanksgiving Day
Christmas Day

Paid Holidays

None

(District Council of Painters #9)

PAINTER - SIGN

Designer

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$36.15

Supplemental Benefit Rate per Hour: \$9.66

Journey person

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$33.62

Supplemental Benefit Rate per Hour: \$9.66

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Time and one half the regular rate for Sunday.

Double time the regular rate for work on the following holiday(s).

Paid Holidays

New Year's Day

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Election Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

Shift Rates

All work performed outside the regular 8 hour work day (either 7:00 A.M to 3:30 P.M or 8:00 A.M. to 4:30 P.M) shall be paid at time and one half the regular hourly rate.

(Local #8A-28A)

PAINTER - STRIPER

Striper (paint)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$33.50

Supplemental Benefit Rate per Hour: \$11.62

Supplemental Note: Overtime Supplemental Benefit rate - \$7.42; New Hire Rate (0-3 months) - \$0.00

Lineperson (thermoplastic)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$37.50

Supplemental Benefit Rate per Hour: \$11.62

Supplemental Note: Overtime Supplemental Benefit rate - \$7.42; New Hire Rate (0-3 months) - \$0.00

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Time and one half the regular rate for work on the following holiday(s).

Paid Holidays

New Year's Day

Good Friday

Memorial Day

Independence Day

Labor Day

Columbus Day

Presidential Election Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

Shift Rates

Employees hired before April 1, 2003: 15% night shift premium differential for work commenced at 9:00 PM or later.

Vacation

Employees with one to two years service shall accrue vacation based on hours worked: 250 hours worked - 1 day vacation; 500 hours worked - 2 days vacation; 750 hours worked - 3 days vacation; 900 hours worked - 4 days vacation; 1,000 hours worked - 5 days vacation. Employees with two to five years service receive two weeks vacation. Employees with five to twenty years service receive three weeks vacation. Employees with twenty to twenty-five years service receive four weeks vacation. Employees with 25 or more years service receive five weeks vacation. Vacation must be taken during winter months. 2 Personal Days except employees hired after 4/1/12 who do not have 2 years of service.

(Local #917)

PAINTER - STRUCTURAL STEEL

Painters on Structural Steel

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$47.00

Supplemental Benefit Rate per Hour: \$32.08

Painter - Power Tool

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$53.00

Supplemental Benefit Rate per Hour: \$32.08

Overtime

Time and one half the regular rate after a 7 hour day.

Time and one half the regular rate for Saturday.

Time and one half the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Christmas Day

Paid Holidays

None

Shift Rates

Regular hourly rates plus a ten per cent (10%) differential

(Local #806)

PAPERHANGER

Paperhanger

Effective Period: 7/1/2013 - 4/30/2014

Wage Rate per Hour: \$39.00

Supplemental Benefit Rate per Hour: \$29.23

Supplemental Note: Supplemental benefits are to be paid at the appropriate straight time and overtime rate.

Effective Period: 5/1/2014 - 6/30/2014

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Wage Rate per Hour: \$41.08

Supplemental Benefit Rate per Hour: \$29.23

Supplemental Note: Supplemental benefits are to be paid at the appropriate straight time and overtime rate.

Overtime

Time and one half the regular rate after a 7 hour day.

Time and one half the regular rate for Saturday.

Time and one half the regular rate for Sunday.

Overtime Holidays

Time and one half the regular rate for work on the following holiday(s).

New Year's Day

President's Day

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

Paid Holidays

None

Shift Rates

Evening shift - 4:30 P.M. to 12:00 Midnight (regular rate of pay); any work performed before 7:00 A.M. shall be at time and one half the regular base rate of pay.

(District Council of Painters #9)

PAVER AND ROADBUILDER

Paver & Roadbuilder - Formsetter

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$43.54

Supplemental Benefit Rate per Hour: \$33.55

Paver & Roadbuilder - Laborer

Paving and road construction work, regardless of material used, including but not limited to preparation of job sites, removal of old surfaces, asphalt and/or concrete, by whatever method, including but not limited to milling; laying of concrete; laying of asphalt for temporary, patchwork, and utility paving (but not production paving); site preparation and incidental work before the installation of rubberized materials and similar surfaces; installation and repair of temporary construction fencing; slurry seal coating, maintenance of safety surfaces; play equipment installation, and other related work.

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$39.67

Supplemental Benefit Rate per Hour: \$33.55

Production Paver & Roadbuilder - Screed Person

(Production paving is asphalt paving when using a paving machine or on a project where a paving machine is traditionally used)

Adjustment of paving machinery on production paving jobs.

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$45.12

Supplemental Benefit Rate per Hour: \$33.55

Production Paver & Roadbuilder - Raker

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$44.61

Supplemental Benefit Rate per Hour: \$33.55

Production Paver & Roadbuilder - Shoveler

General laborer (except removal of surfaces - see Paver and Roadbuilder-Laborer) including but not limited to tamper, AC paint and liquid tar work.

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$41.32

Supplemental Benefit Rate per Hour: \$33.55

Overtime Description

Veteran's Day is a Paid Holiday for employees working on production paving.

If an employee works New Year's Day or Christmas Day, they receive the single time rate plus 25%.

Employees who work on a holiday listed below receive the straight time rate plus one day's pay for the holiday.

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Paid Holidays

Memorial Day

Independence Day

Labor Day

Presidential Election Day

Thanksgiving Day

Shift Rates

When two shifts are employed, the work period for each shift shall be a continuous eight (8) hours. When three shifts are employed, each shift will work seven and one half (7 ½) hours but will be paid for eight (8) hours since only one half (1/2) hour is allowed for meal time.

When two or more shifts are employed, single time will be paid for each shift.

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 PREVAILING WAGE SCHEDULE

Night Work - On night work, the first eight (8) hours of work will be paid for at the single time rate, except that production paving work shall be paid at 20% over the single time rate for the screed person, rakers and shovelers directly involved only. All other workers will be exempt. Hours worked over eight (8) hours during said shift shall be paid for at the time and one-half rate.

(Local #1010)

PLASTERER

Plasterer

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$41.13

Supplemental Benefit Rate per Hour: \$24.95

Overtime

Time and one half the regular rate after a 7 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

Martin Luther King Jr. Day

President's Day

Good Friday

Memorial Day

Independence Day

Labor Day

Columbus Day

Presidential Election Day

Thanksgiving Day

Christmas Day

Paid Holidays

None

Shift Rates

When it is not possible to conduct alteration work during regular work hours, in a building occupied by tenants, said work shall proceed on a shift basis; however work over seven (7) hours in any twenty four (24) hour period, the time after seven (7) hours shall be considered overtime:

The second shift shall start at a time between 3:30 p.m. and 7:00 p.m. and shall consist of seven (7) working hours and shall receive eight (8) hours of wages and benefits at the straight time rate. The workers on the second shift shall be allowed one-half (1/2) hour to eat with this time being included in the seven (7) hours of work.

(Local #530)

PLASTERER - TENDER

Plasterer - Tender

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: **\$35.00**

Supplemental Benefit Rate per Hour: **\$25.74**

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

Washington's Birthday

Memorial Day

Independence Day

Labor Day

Presidential Election Day

Thanksgiving Day

Christmas Day

Paid Holidays

None

Shift Rates

When work commences outside regular work hours, workers receive an hour additional (differential) wage and supplement payment. Eight hours pay for seven hours work or nine hours pay for eight hours work.

(Mason Tenders District Council)

PLUMBER

Plumber

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: **\$52.36**

Supplemental Benefit Rate per Hour: **\$37.34**

Supplemental Note: Overtime supplemental benefit rate per hour: **\$74.40**

Overtime Description

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 PREVAILING WAGE SCHEDULE

Double time the regular rate after a 7 hour day - unless for new construction site work where the plumbing contract price is \$1.5 million or less, the hours of labor can be 8 hours per day at the employers option. On Alteration jobs when other mechanical trades at the site are working an eighth hour at straight time, then the plumber shall also work an eighth hour at straight time.

Overtime

Double time the regular time rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Shift Rates

Shift work, when directly specified in public agency or authority documents where plumbing contract is \$8 million or less, will be permitted. 30% shift premium shall be paid for wages and fringe benefits for 4:00 pm and midnight shifts Monday to Friday. 50% shift premium shall be paid for wages and fringe benefits for 4:00 pm and midnight shift work performed on weekends. For shift work on holidays, double time wages and fringe benefits shall be paid.

(Plumbers Local #1)

PLUMBER (MECHANICAL EQUIPMENT AND SERVICE)
(Mechanical Equipment and Service work shall include any repair and/or replacement of the present plumbing system.)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: **\$33.46**

Supplemental Benefit Rate per Hour: **\$16.93**

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.

Overtime Holidays

Time and one half the regular rate for work on the following holiday(s).
New Year's Day
President's Day

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 PREVAILING WAGE SCHEDULE

Memorial Day
Independence Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays

None

(Plumbers Local # 1)

PLUMBER (RESIDENTIAL RATES FOR 1, 2 AND 3 FAMILY HOME CONSTRUCTION)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$37.11

Supplemental Benefit Rate per Hour: \$25.56

Overtime

Double time the regular rate after an 8 hour day.

Double time the regular time rate for Saturday.

Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays

None

Shift Rates

30% shift premium shall be paid for wages and fringe benefits for 4:00 pm and midnight shifts Monday to Friday.
50% shift premium shall be paid for wages and fringe benefits for 4:00 pm and midnight shift work performed on weekends. For shift work on holidays, double time wages and fringe benefits shall be paid.

(Plumbers Local #1)

**PLUMBER: PUMP & TANK
(Installation and Maintenance)**

Plumber - Pump & Tank

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$53.01

Supplemental Benefit Rate per Hour: \$31.86

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Time and one half the regular rate for Sunday.

Overtime Holidays

Time and one half the regular rate for work on the following holiday(s).

New Year's Day

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Veteran's Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

Paid Holidays

None

Shift Rates

All work outside the regular workday (8:00 A.M. to 3:30 P.M.) is to be paid at time and one half the regular hourly rate

(Plumbers Local #1)

**POINTER - WATERPROOFER, CAULKER MECHANIC (EXTERIOR BUILDING
RENOVATION)**

Pointer - Waterproofer, Caulker Mechanic

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$45.41

Supplemental Benefit Rate per Hour: \$23.29

Overtime

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 PREVAILING WAGE SCHEDULE

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Time and one half the regular rate for Sunday.

Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays

Time and one half the regular rate for work on the following holiday(s).

New Year's Day

Martin Luther King Jr. Day

President's Day

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Christmas Day

Paid Holidays

None

Shift Rates

All work outside the regular work day (an eight hour workday between the hours of 6:00 A.M. and 4:30 P.M.) is to be paid at time and one half the regular rate.

(Bricklayer District Council)

ROOFER

Roofer

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$39.00

Supplemental Benefit Rate per Hour: \$27.37

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Time and one half the regular rate for Sunday.

Overtime Holidays

Time and one half the regular rate for work on the following holiday(s).

New Year's Day

President's Day

Memorial Day

Independence Day

Labor Day

Presidential Election Day

Thanksgiving Day

Christmas Day

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 PREVAILING WAGE SCHEDULE

Paid Holidays

None

Shift Rates

Second shift - Regular hourly rate plus a 10% differential. Third shift - Regular hourly rate plus a 15% differential.

(Local #8)

**SANDBLASTER - STEAMBLASTER
(Exterior Building Renovation)**

Sandblaster / Steamblaster

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$45.41

Supplemental Benefit Rate per Hour: \$23.29

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Time and one half the regular rate for Sunday.

Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays

Time and one half the regular rate for work on the following holiday(s).

New Year's Day

Martin Luther King Jr. Day

President's Day

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Christmas Day

Paid Holidays

None

Shift Rates

All work outside the regular work day (an eight hour workday between the hours of 6:00 A.M. and 4:30 P.M.) is to be paid at time and one half the regular rate.

(Bricklayer District Council)

SHEET METAL WORKER

Sheet Metal Worker

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$45.96

Supplemental Benefit Rate per Hour: \$43.19

Supplemental Note: Supplemental benefit contributions are to be made at the applicable overtime rates.

Sheet Metal Worker - Duct Cleaner

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$12.90

Supplemental Benefit Rate per Hour: \$8.07

Sheet Metal Worker - Fan Maintenance

(The temporary operation of fans or blowers in new or existing buildings for heating and/or ventilation, and/or air conditioning prior to the completion of the project.)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$36.77

Supplemental Benefit Rate per Hour: \$43.19

Overtime

Time and one half the regular rate after a 7 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

Martin Luther King Jr. Day

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Veteran's Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

Paid Holidays

None

Shift Rates

Work that can only be performed outside regular working hours (seven hours of work between 7:30 A.M. and 3:30 P.M.) - First shift (work between 3:30 P.M. and 11:30 P.M.) - 10% differential above the established hourly rate.

Second shift (work between 11:30 P.M. and 7:30 A.M.) - 15% differential above the established hourly rate.

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 PREVAILING WAGE SCHEDULE

For Fan Maintenance: On all full shifts of fan maintenance work the straight time hourly rate of pay will be paid for each shift, including nights, Saturdays, Sundays, and holidays. No journey person engaged in fan maintenance shall work in excess of forty (40) hours in any work week.

(Local #28)

SHEET METAL WORKER - SPECIALTY
(Decking & Siding)

Sheet Metal Specialty Worker

The first worker to perform this work must be paid at the rate of the Sheet Metal Worker. The second and third workers shall be paid the Specialty Worker Rate. The ratio of One Sheet Metal Worker, then Two Specialty Workers shall be utilized thereafter.

Effective Period: 7/1/2013 - 7/31/2013

Wage Rate per Hour: **\$41.28**

Supplemental Benefit Rate per Hour: **\$22.88**

Supplemental Note: Supplemental benefit contributions are to be made at the applicable overtime rates.

Effective Period: 8/1/2013 - 6/30/2014

Wage Rate per Hour: **\$40.78**

Supplemental Benefit Rate per Hour: **\$23.38**

Supplemental Note: Supplemental benefit contributions are to be made at the applicable overtime rates.

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

Martin Luther King Jr. Day

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Veteran's Day

Thanksgiving Day

Christmas Day

Paid Holidays

None

(Local #28)

SIGN ERECTOR
(Sheet Metal, Plastic, Electric, and Neon)

Sign Erector

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: **\$42.80**

Supplemental Benefit Rate per Hour: **\$42.17**

Overtime

Time and one half the regular rate after a 7 hour day.

Time and one half the regular rate for Saturday.

Time and one half the regular rate for Sunday.

Time and one half the regular rate for work on the following holiday(s).

Paid Holidays

New Year's Day

Washington's Birthday

Memorial Day

Independence Day

Labor Day

Columbus Day

Election Day

Thanksgiving Day

Day after Thanksgiving

Christmas Day

Shift Rates

Time and one half the regular hourly rate is to be paid for all hours worked outside the regular workday either (7:00 A.M. through 2:30 P.M.) or (8:00 A.M. through 3:30 P.M.)

(Local #137)

STEAMFITTER

Steamfitter I

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: **\$52.50**

Supplemental Benefit Rate per Hour: **\$50.54**

Supplemental Note: Overtime supplemental benefit rate: **\$100.34**

Overtime

Double time the regular rate after a 7 hour day.

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 PREVAILING WAGE SCHEDULE

Double time the regular time rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays

None

Shift Rates

Work performed between 3:30 P.M. and 7:00 A.M. and on Saturdays, Sundays and Holidays shall be at double time the regular hourly rate and paid at the overtime supplemental benefit rate above.

Steamfitter II

For heating, ventilation, air conditioning and mechanical public works contracts with a dollar value not to exceed \$15,000,000 and for fire protection/sprinkler public works contracts not to exceed \$1,500,000.

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: **\$52.50**

Supplemental Benefit Rate per Hour: **\$50.54**

Supplemental Note: Overtime supplemental benefit rate: **\$100.34**

Overtime

Double time the regular rate after an 8 hour day.
Double time the regular time rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays

None

Shift Rates

May be performed outside of the regular workday except Saturday, Sunday and Holidays. A shift shall consist of eight working hours. All work performed in excess of eight hours shall be paid at double time. No shift shall commence after 7:00 P.M. on Friday or 7:00 P.M. the day before holidays. All work performed after 12:01 A.M. Saturday or 12:01 A.M. the day before a Holiday will be paid at double time. When shift work is performed the wage rate for regular time worked is a thirty percent premium together with fringe benefits.

On Transit Authority projects, where work is performed in the vicinity of tracks all shift work on weekends and holidays may be performed at the regular shift rates.

Local #638

**STEAMFITTER - REFRIGERATION AND AIR CONDITIONER
(Maintenance and Installation Service Person)**

Refrigeration and Air Conditioner Mechanic

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$38.05

Supplemental Benefit Rate per Hour: \$12.26

Refrigeration and Air Conditioner Service Person V

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$31.26

Supplemental Benefit Rate per Hour: \$11.13

Refrigeration and Air Conditioner Service Person IV

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$25.90

Supplemental Benefit Rate per Hour: \$10.16

Refrigeration and Air Conditioner Service Person III

Filter changing and maintenance thereof, oil and greasing, tower and coil cleaning, scraping and painting, general housekeeping, taking of water samples.

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$22.23

Supplemental Benefit Rate per Hour: \$9.44

Refrigeration and Air Conditioner Service Person II

Filter changing and maintenance thereof, oil and greasing, tower and coil cleaning, scraping and painting, general housekeeping, taking of water samples.

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$18.44

Supplemental Benefit Rate per Hour: \$8.78

Refrigeration and Air Conditioner Service Person I

Filter changing and maintenance thereof, oil and greasing, tower and coil cleaning, scraping and painting, general housekeeping, taking of water samples.

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$13.48

Supplemental Benefit Rate per Hour: \$8.10

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

Independence Day

Labor Day

Veteran's Day

Thanksgiving Day

Christmas Day

Double time and one half the regular rate for work on the following holiday(s).

Martin Luther King Jr. Day

President's Day

Memorial Day

Columbus Day

Paid Holidays

New Year's Day

Martin Luther King Jr. Day

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Veteran's Day

Thanksgiving Day

Christmas Day

(Local #638B)

STONE MASON - SETTER

Stone Mason - Setters

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$47.72

Supplemental Benefit Rate per Hour: \$35.28

Overtime

Time and one half the regular rate after a 7 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

Washington's Birthday

Good Friday

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

Christmas Day

Paid Holidays

1/2 day on Christmas Eve if work is performed in the A.M.

Shift Rates

For all work outside the regular workday (8:00 A.M. to 3:30 P.M. Monday through Friday), the pay shall be straight time plus a ten percent (10%) differential.

(Bricklayers District Council)

TAPER

Drywall Taper

Effective Period: 7/1/2013 - 12/31/2013

Wage Rate per Hour: \$44.32

Supplemental Benefit Rate per Hour: \$21.66

Effective Period: 1/1/2014 - 6/24/2014

Wage Rate per Hour: \$44.82

Supplemental Benefit Rate per Hour: \$21.66

Effective Period: 6/25/2014 - 6/30/2014

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§220 PREVAILING WAGE SCHEDULE

Wage Rate per Hour: **\$45.32**

Supplemental Benefit Rate per Hour: **\$21.66**

Overtime

Time and one half the regular rate after a 7 hour day.

Time and one half the regular rate for Saturday.

Time and one half the regular rate for Sunday.

Overtime Holidays

Time and one half the regular rate for work on the following holiday(s).

New Year's Day

Martin Luther King Jr. Day

President's Day

Good Friday

Memorial Day

Independence Day

Labor Day

Columbus Day

Thanksgiving Day

Christmas Day

Paid Holidays

Any worker who reports to work on Christmas Eve or New Year's Eve pursuant to his employer's instruction shall be entitled to three (3) hours afternoon pay without working.

Shift Rates

Time and one half the regular rate outside the regular work hours (8:00 A.M. through 3:30 P.M.)

(Local #1974)

TELECOMMUNICATION WORKER
(Voice Installation Only)

Telecommunication Worker

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: **\$35.94**

Supplemental Benefit Rate per Hour: **\$13.19**

Supplemental Note: The above rate applies for Manhattan, Bronx, Brooklyn, Queens. \$12.64 for Staten Island only.

Overtime

Time and one half the regular rate after a 7 hour day.

Time and one half the regular rate for Saturday.

Time and one half the regular rate for Sunday.

Overtime Holidays

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§220 PREVAILING WAGE SCHEDULE

Time and one half the regular rate for work on the following holiday(s).

- New Year's Day
- Lincoln's Birthday
- Washington's Birthday
- Memorial Day
- Independence Day
- Labor Day
- Columbus Day
- Election Day
- Veteran's Day
- Thanksgiving Day
- Christmas Day

Paid Holidays

- New Year's Day
- Lincoln's Birthday
- Washington's Birthday
- Memorial Day
- Independence Day
- Labor Day
- Columbus Day
- Election Day
- Veteran's Day
- Thanksgiving Day
- Christmas Day

Employees have the option of observing either Martin Luther King's Birthday or the day after Thanksgiving instead of Lincoln's Birthday

Shift Rates

For any workday that starts before 8A.M. or ends after 6P.M. there is a 10% differential for the applicable worker's hourly rate.

Vacation

- After 6 months.....one week.
- After 12 months but less than 7 years.....two weeks.
- After 7 or more but less than 15 years.....three weeks.
- After 15 years or more but less than 25 years.....four weeks.

(C.W.A.)

TILE FINISHER

Tile Finisher

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: **\$38.49**
Supplemental Benefit Rate per Hour: **\$27.40**

Overtime

Time and one half the regular rate after a 7 hour day.
Time and one half the regular rate for Saturday.

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 PREVAILING WAGE SCHEDULE

Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays

None

Shift Rates

Off shift work day (work performed outside the regular 8:00 A.M. to 3:30 P.M. workday): shift differential of one and one quarter (1¼) times the regular straight time rate of pay for the seven hours of actual off-shift work.

(Local #7)

TILE LAYER - SETTER

Tile Layer - Setter

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: **\$48.35**

Supplemental Benefit Rate per Hour: **\$31.44**

Overtime

Time and one half the regular rate after a 7 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 PREVAILING WAGE SCHEDULE

Christmas Day

Shift Rates

Off shift work day (work performed outside the regular 8:00 A.M. to 3:30 P.M. workday): shift differential of one and one quarter (1¼) times the regular straight time rate of pay for the seven hours of actual off-shift work.

(Local #7)

TIMBERPERSON

Timberperson

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$42.63

Supplemental Benefit Rate per Hour: \$44.54

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Time and one half the regular hourly rate after 40 hours in any work week.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

New Year's Day

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Presidential Election Day

Thanksgiving Day

Christmas Day

Paid Holidays

None

Shift Rates

Off shift work commencing between 5:00 P.M. and 11:00 P.M. shall work eight and one half hours allowing for one half hour for lunch. The wage rate shall be 113% of the straight time hourly wage rate.

(Local #1536)

TUNNEL WORKER

Blasters, Mucking Machine Operators (Compressed Air Rates)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$54.20
Supplemental Benefit Rate per Hour: \$48.20

Tunnel Workers (Compressed Air Rates)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$52.31
Supplemental Benefit Rate per Hour: \$46.59

Top Nipper (Compressed Air Rates)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$51.35
Supplemental Benefit Rate per Hour: \$45.78

Outside Lock Tender, Outside Gauge Tender, Muck Lock Tender (Compressed Air Rates)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$50.42
Supplemental Benefit Rate per Hour: \$44.91

Bottom Bell & Top Bell Signal Person: Shaft Person (Compressed Air Rates)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$50.42
Supplemental Benefit Rate per Hour: \$44.92

Changehouse Attendant: Powder Watchperson (Compressed Air Rates)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$43.94
Supplemental Benefit Rate per Hour: \$42.55

Blasters (Free Air Rates)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$51.72
Supplemental Benefit Rate per Hour: \$46.03

Tunnel Workers (Free Air Rates)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$49.48

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Supplemental Benefit Rate per Hour: \$44.06

All Others (Free Air Rates)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$45.73

Supplemental Benefit Rate per Hour: \$40.75

Microtunneling (Free Air Rates)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$39.58

Supplemental Benefit Rate per Hour: \$35.25

Overtime Description

For Repair-Maintenance Work on Existing Equipment and Facilities - Time and one half the regular rate after a 7 hour day, or for Saturday, or for Sunday. Double time the regular rate for work on a holiday.

For Small-Bore Micro Tunneling Machines - Time and one-half the regular rate shall be paid for all overtime.

Overtime

Double time the regular rate after an 8 hour day.

Double time the regular time rate for Saturday.

Double time the regular rate for Sunday.

Double time the regular rate for work on the following holiday(s).

Paid Holidays

New Year's Day

Lincoln's Birthday

President's Day

Memorial Day

Independence Day

Labor Day

Columbus Day

Election Day

Veteran's Day

Thanksgiving Day

Christmas Day

(Local #147)

WELDER

**TO BE PAID AT THE RATE OF THE JOURNEYPERSON IN THE TRADE
PERFORMING THE WORK.**

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OFFICE OF THE COMPTROLLER

CITY OF NEW YORK

220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

APPENDIX

Pursuant to Labor Law §220 (3-e), only apprentices who are individually registered in a bona fide program to which the employer contractor is a participant and registered with the New York State Department of Labor, may be employed on a public work project.

Any employee listed on a payroll at an apprentice wage rate, who is not registered as above, shall be paid the journey person wage rate for the classification of work he actually performed.

Apprentice ratios are established to ensure the proper safety, training and supervision of apprentices. A ratio establishes the number of journey workers required for each apprentice in a program and on a job site. Ratios are interpreted as follows: in the case of a 1:1, 1:4 ratio, there must be one journey worker for the first apprentice, and four additional journey workers for each subsequent apprentice.

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ASBESTOS HANDLER

(Ratio of Apprentice Journeyperson: 1 to 1, 1 to 3)

Asbestos Handler (First 1000 Hours)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 78% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: \$15.05

Asbestos Handler (Second 1000 Hours)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 80% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: \$15.05

Asbestos Handler (Third 1000 Hours)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 83% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: \$15.05

Asbestos Handler (Fourth 1000 Hours)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 89% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: \$15.05

(Local #78)

BOILERMAKER

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Boilermaker (First Year)

Effective Period: 7/1/2013 - 12/31/2013
Wage Rate Per Hour: 65% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: \$28.75

Effective Period: 1/1/2014 - 6/30/2014
Wage Rate Per Hour: 65% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: \$29.74

Boilermaker (Second Year: 1st Six Months)

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Effective Period: 7/1/2013 - 12/31/2013
Wage Rate Per Hour: 70% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: \$30.33

Effective Period: 1/1/2014 - 6/30/2014
Wage Rate Per Hour: 75% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: \$31.40

Boilermaker (Second Year: 2nd Six Months)

Effective Period: 7/1/2013 - 12/31/2013
Wage Rate Per Hour: 75% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: \$31.91

Effective Period: 1/1/2014 - 6/30/2014
Wage Rate Per Hour: 75% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: \$33.05

Boilermaker (Third Year: 1st Six Months)

Effective Period: 7/1/2013 - 12/31/2013
Wage Rate Per Hour: 80% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: \$33.49

Effective Period: 1/1/2014 - 6/30/2014
Wage Rate Per Hour: 80% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: \$34.69

Boilermaker (Third Year: 2nd Six Months)

Effective Period: 7/1/2013 - 12/31/2013
Wage Rate Per Hour: 85% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: \$35.05

Effective Period: 1/1/2014 - 6/30/2014
Wage Rate Per Hour: 85% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: \$36.34

Boilermaker (Fourth Year: 1st Six Months)

Effective Period: 7/1/2013 - 12/31/2013
Wage Rate Per Hour: 90% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: \$36.63

Effective Period: 1/1/2014 - 6/30/2014
Wage Rate Per Hour: 90% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: \$38.00

Boilermaker (Fourth Year: 2nd Six Months)

Effective Period: 7/1/2013 - 12/31/2013

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Wage Rate Per Hour: 95% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: \$38.19

Effective Period: 1/1/2014 - 6/30/2014
Wage Rate Per Hour: 95% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: \$39.65

(Local #5)

BRICKLAYER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Bricklayer (First 750 Hours)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 50% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: \$16.60

Bricklayer (Second 750 Hours)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 60% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: \$16.60

Bricklayer (Third 750 Hours)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 70% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: \$16.60

Bricklayer (Fourth 750 Hours)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 80% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: \$16.60

Bricklayer (Fifth 750 Hours)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 90% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: \$16.60

Bricklayer (Sixth 750 Hours)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 95% of Journeyperson's rate

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§220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

Supplemental Benefit Rate Per Hour: \$16.60

(Bricklayer District Council)

CARPENTER
(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 4)

Carpenter (First Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 40% of Journeyman's rate
Supplemental Benefit Rate Per Hour: \$30.29

Carpenter (Second Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 50% of Journeyman's rate
Supplemental Benefit Rate Per Hour: \$30.29

Carpenter (Third Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 65% of Journeyman's rate
Supplemental Benefit Rate Per Hour: \$30.29

Carpenter (Fourth Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 80% of Journeyman's rate
Supplemental Benefit Rate Per Hour: \$30.29

(Carpenters District Council)

CEMENT MASON
(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 4)

Cement Mason (First Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage and Supplemental Rate Per Hour: 50% of Journeyman's Rate

Cement Mason (Second Year)

Effective Period: 7/1/2013 - 6/30/2014

Wage and Supplemental Rate Per Hour: 60% of Journeyman's Rate

Cement Mason (Third Year)

Effective Period: 7/1/2013 - 6/30/2014

Wage and Supplemental Rate Per Hour: 70% of Journeyman's Rate

(Local #780)

CEMENT AND CONCRETE WORKER

(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 3)

Cement & Concrete Worker (0 - 500 hours)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate Per Hour: 50% of Journeyman's rate

Supplemental Benefit Rate Per Hour: \$18.04

Cement & Concrete Worker (501 - 1000 hours)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate Per Hour: 65% of Journeyman's rate

Supplemental Benefit Rate Per Hour: \$18.87

Cement & Concrete Worker (1001 - 2000 hours)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate Per Hour: 65% of Journeyman's rate

Supplemental Benefit Rate Per Hour: \$24.25

Cement & Concrete Worker (2001 - 4000 hours)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate Per Hour: 80% of Journeyman's rate

Supplemental Benefit Rate Per Hour: \$25.07

(Cement Concrete Workers District Council)

DERRICKPERSON & RIGGER (STONE)
(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 6)

Derrickperson & Rigger (stone) - First Year

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 50% of Journeyman's rate
Supplemental Benefit Rate Per Hour: 50% of Journeyman's rate

Derrickperson & Rigger (stone) - Second Year: 1st Six Months

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 70% of Journeyman's rate
Supplemental Benefit Rate Per Hour: 75% of Journeyman's rate

Derrickperson & Rigger (stone) - Second Year: 2nd Six Months

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 80% of Journeyman's rate
Supplemental Benefit Rate Per Hour: 75% of Journeyman's rate

Derrickperson & Rigger (stone) - Third Year

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 90% of Journeyman's rate
Supplemental Benefit Rate Per Hour: 75% of Journeyman's rate

(Local #197)

DOCKBUILDER/PILE DRIVER
(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 6)

Dockbuilder/Pile Driver (First Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 40% of Journeyman's rate
Supplemental Benefit Rate Per Hour: \$30.29

Dockbuilder/Pile Driver (Second Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 50% of Journeyman's rate
Supplemental Benefit Rate Per Hour: \$30.29

Dockbuilder/Pile Driver (Third Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 65% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: \$30.29

Dockbuilder/Pile Driver (Fourth Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 80% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: \$30.29

(Carpenters District Council)

ELECTRICIAN

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Electrician (First Term: 0-6 Months)

Effective period: 7/1/2013 - 5/13/2014
Wage Rate per Hour: \$12.50
Supplemental Benefit Rate per Hour: \$10.86
Overtime Supplemental Rate per Hour: \$11.68

Effective period: 5/14/2014 - 6/30/2014
Wage Rate per Hour: \$12.50
Supplemental Benefit Rate per Hour: \$11.10
Overtime Supplemental Rate per Hour: \$11.93

Electrician (First Term: 7-12 Months)

Effective period: 7/1/2013 - 5/13/2014
Wage Rate per Hour: \$13.50
Supplemental Benefit Rate per Hour: \$11.37
Overtime Supplemental Rate per Hour: \$12.26

Effective period: 5/14/2014 - 6/30/2014
Wage Rate per Hour: \$13.50
Supplemental Benefit Rate per Hour: \$11.62
Overtime Supplemental Rate per Hour: \$12.51

Electrician (Second Term: 0-6 Months)

Effective period: 7/1/2013 - 5/13/2014
Wage Rate per Hour: \$14.50

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Supplemental Benefit Rate per Hour: \$11.88
Overtime Supplemental Rate per Hour: \$12.83

Effective period: 5/14/2014 - 6/30/2014

Wage Rate per Hour: \$14.50
Supplemental Benefit Rate per Hour: \$12.13
Overtime Supplemental Rate per Hour: \$13.08

Electrician (Second Term: 7-12 Months)

Effective period: 7/1/2013 - 5/13/2014

Wage Rate per Hour: \$15.50
Supplemental Benefit Rate per Hour: \$12.39
Overtime Supplemental Rate per Hour: \$13.41

Effective period: 5/14/2014 - 6/30/2014

Wage Rate per Hour: \$15.50
Supplemental Benefit Rate per Hour: \$12.64
Overtime Supplemental Rate per Hour: \$13.66

Electrician (Third Term: 0-6 Months)

Effective period: 7/1/2013 - 5/13/2014

Wage Rate per Hour: \$16.50
Supplemental Benefit Rate per Hour: \$12.90
Overtime Supplemental Rate per Hour: \$13.98

Effective period: 5/14/2014 - 6/30/2014

Wage Rate per Hour: \$16.50
Supplemental Benefit Rate per Hour: \$13.15
Overtime Supplemental Rate per Hour: \$14.23

Electrician (Third Term: 7-12 Months)

Effective period: 7/1/2013 - 5/13/2014

Wage Rate per Hour: \$17.50
Supplemental Benefit Rate per Hour: \$13.40
Overtime Supplemental Rate per Hour: \$14.56

Effective period: 5/14/2014 - 6/30/2014

Wage Rate per Hour: \$17.50
Supplemental Benefit Rate per Hour: \$13.65
Overtime Supplemental Rate per Hour: \$14.81

Electrician (Fourth Term: 0-6 Months - Hired on or after 5/10/07)

Effective period: 7/1/2013 - 5/13/2014

Wage Rate per Hour: \$18.50
Supplemental Benefit Rate per Hour: \$13.91
Overtime Supplemental Rate per Hour: \$15.13

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Effective period: 5/14/2014 - 6/30/2014
Wage Rate per Hour: \$18.50
Supplemental Benefit Rate per Hour: \$14.16
Overtime Supplemental Rate per Hour: \$15.38

Electrician (Fourth Term: 7-12 Months - Hired on or after 5/10/07)

Effective period: 7/1/2013 - 5/13/2014
Wage Rate per Hour: \$20.25
Supplemental Benefit Rate per Hour: \$14.80
Overtime Supplemental Rate per Hour: \$16.14

Effective period: 5/14/2014 - 6/30/2014
Wage Rate per Hour: \$20.50
Supplemental Benefit Rate per Hour: \$15.18
Overtime Supplemental Rate per Hour: \$16.53

Electrician (Fifth Term: 0-12 Months - Hired on or after 5/10/07)

Effective period: 7/1/2013 - 5/13/2014
Wage Rate per Hour: \$22.00
Supplemental Benefit Rate per Hour: \$17.30
Overtime Supplemental Rate per Hour: \$18.68

Effective period: 5/14/2014 - 6/30/2014
Wage Rate per Hour: \$22.50
Supplemental Benefit Rate per Hour: \$18.06
Overtime Supplemental Rate per Hour: \$19.47

Electrician (Fifth Term: 13-18 Months - Hired on or after 5/10/07)

Effective period: 7/1/2013 - 5/13/2014
Wage Rate per Hour: \$26.50
Supplemental Benefit Rate per Hour: \$19.56
Overtime Supplemental Rate per Hour: \$21.23

Effective period: 5/14/2014 - 6/30/2014
Wage Rate per Hour: \$27.00
Supplemental Benefit Rate per Hour: \$20.32
Overtime Supplemental Rate per Hour: \$22.01

Electrician (Fourth Term: 0-6 Months - Hired before 5/10/07)

Effective period: 7/1/2013 - 5/13/2014
Wage Rate per Hour: \$22.10
Supplemental Benefit Rate per Hour: \$15.74
Overtime Supplemental Rate per Hour: \$17.20

Effective period: 5/14/2014 - 6/30/2014

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Wage Rate per Hour: **\$22.10**
Supplemental Benefit Rate per Hour: **\$15.99**
Overtime Supplemental Rate per Hour: **\$17.45**

Electrician (Fourth Term: 7-12 Months - Hired before 5/10/07)

Effective period: 7/1/2013 - 5/13/2014
Wage Rate per Hour: **\$23.95**
Supplemental Benefit Rate per Hour: **\$16.69**
Overtime Supplemental Rate per Hour: **\$18.26**

Effective period: 5/14/2014 - 6/30/2014
Wage Rate per Hour: **\$24.20**
Supplemental Benefit Rate per Hour: **\$17.06**
Overtime Supplemental Rate per Hour: **\$18.66**

Electrician (Fifth Term: 0-18 Months - Hired before 5/10/07)

Effective period: 7/1/2013 - 5/13/2014
Wage Rate per Hour: **\$25.80**
Supplemental Benefit Rate per Hour: **\$19.21**
Overtime Supplemental Rate per Hour: **\$20.83**

Effective period: 5/14/2014 - 6/30/2014
Wage Rate per Hour: **\$26.30**
Supplemental Benefit Rate per Hour: **\$19.96**
Overtime Supplemental Rate per Hour: **\$21.61**

Overtime Description

Overtime Wage paid at time and one half the regular rate
For "A" rated Apprentices (work in excess of 7 hours per day)
For "M" rated Apprentices (work in excess of 8 hours per day)

(Local #3)

ELEVATOR CONSTRUCTOR

(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 2)

Elevator (Constructor) - First Year

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 50% of Journeyman's rate
Supplemental Rate Per Hour: **\$26.87**

Elevator (Constructor) - Second Year

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 55% of Journeyperson's rate
Supplemental Rate Per Hour: \$27.92

Elevator (Constructor) - Third Year

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 65% of Journeyperson's rate
Supplemental Rate Per Hour: \$29.38

Elevator (Constructor) - Fourth Year

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 75% of Journeyperson's rate
Supplemental Rate Per Hour: \$30.84

(Local #1)

**ELEVATOR REPAIR & MAINTENANCE
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 2)**

Elevator Service/Modernization Mechanic (First Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 50% of Journeyperson's rate
Supplemental Benefit Per Hour: \$26.79

Elevator Service/Modernization Mechanic (Second Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 55% of Journeyperson's rate
Supplemental Benefit Per Hour: \$27.12

Elevator Service/Modernization Mechanic (Third Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 65% of Journeyperson's rate
Supplemental Benefit Per Hour: \$28.43

Elevator Service/Modernization Mechanic (Fourth Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 75% of Journeyperson's rate
Supplemental Benefit Per Hour: \$29.74

(Local #1)

ENGINEER

(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 5)

Engineer - First Year

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$22.49

Supplemental Benefit Rate per Hour: \$20.68

Engineer - Second Year

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$28.11

Supplemental Benefit Rate per Hour: \$20.68

Engineer - Third Year

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$20.92

Supplemental Benefit Rate per Hour: \$20.68

Engineer - Fourth Year

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$33.73

Supplemental Benefit Rate per Hour: \$20.68

(Local #15)

ENGINEER - OPERATING

(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 5)

Operating Engineer - First Year

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate Per Hour 40% of Journeyman's Rate

Supplemental Benefit Per Hour: \$18.60

Operating Engineer - Second Year

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 50% of Journeyperson's Rate
Supplemental Benefit Per Hour: \$18.60

Operating Engineer - Third Year

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 60% of Journeyperson's Rate
Supplemental Benefit Per Hour: \$18.60

(Local #14)

FLOOR COVERER

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Floor Coverer (First Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 40% of Journeyperson's rate
Supplemental Rate Per Hour: \$25.75

Floor Coverer (Second Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 50% of Journeyperson's rate
Supplemental Rate Per Hour: \$25.75

Floor Coverer (Third Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 65% of Journeyperson's rate
Supplemental Rate Per Hour: \$25.75

Floor Coverer (Fourth Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 80% of Journeyperson's rate
Supplemental Rate Per Hour: \$25.75

(Carpenters District Council)

GLAZIER

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Glazier (First Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 40% of Journeyperson's rate
Supplemental Rate Per Hour: \$11.97

Glazier (Second Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 50% of Journeyperson's rate
Supplemental Rate Per Hour: \$21.13

Glazier (Third Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 60% of Journeyperson's rate
Supplemental Rate Per Hour: \$23.54

Glazier (Fourth Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 80% of Journeyperson's rate
Supplemental Rate Per Hour: \$28.34

(Local #1281)

HEAT & FROST INSULATOR

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Heat & Frost Insulator (First Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage and Supplemental Rate Per Hour: 40% of Journeyperson's rate

Heat & Frost Insulator (Second Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage and Supplemental Rate Per Hour: 60% of Journeyperson's rate

Heat & Frost Insulator (Third Year)

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Effective Period: 7/1/2013 - 6/30/2014

Wage and Supplemental Rate Per Hour: 70% of Journeyman's rate

Heat & Frost Insulator (Fourth Year)

Effective Period: 7/1/2013 - 6/30/2014

Wage and Supplemental Rate Per Hour: 80% of Journeyman's rate

(Local #12)

**HOUSE WRECKER
(TOTAL DEMOLITION)**

(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 3)

House Wrecker - First Year

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$20.36

Supplemental Benefit Rate per Hour: \$16.35

House Wrecker - Second Year

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$21.46

Supplemental Benefit Rate per Hour: \$16.35

House Wrecker - Third Year

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$23.01

Supplemental Benefit Rate per Hour: \$16.35

House Wrecker - Fourth Year

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$25.36

Supplemental Benefit Rate per Hour: \$16.35

(Local #79)

IRON WORKER - ORNAMENTAL

(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 4)

Iron Worker (Ornamental) - 1st Four Months - Hired on or Before 8/1/08

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 60% of Journeyman's rate
Supplemental Rate Per Hour: \$35.78

Iron Worker (Ornamental) 5 - 10 Months - Hired on or Before 8/1/08

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 65% of Journeyman's rate
Supplemental Rate Per Hour: \$36.75

Iron Worker (Ornamental) 11 - 16 Months - Hired on or Before 8/1/08

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 70% of Journeyman's rate
Supplemental Rate Per Hour: \$37.72

Iron Worker (Ornamental) 17 - 22 Months - Hired on or Before 8/1/08

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 80% of Journeyman's rate
Supplemental Rate Per Hour: \$39.66

Iron Worker (Ornamental) 23 - 28 Months - Hired on or Before 8/1/08

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 85% of Journeyman's rate
Supplemental Rate Per Hour: \$40.63

Iron Worker (Ornamental) 29 - 36 Months - Hired on or Before 8/1/08

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 95% of Journeyman's rate
Supplemental Rate Per Hour: \$42.57

Iron Worker (Ornamental) - 1st Ten Months - Hired After 8/1/08

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 50% of Journeyman's rate
Supplemental Rate Per Hour: \$33.84

Iron Worker (Ornamental) - 11 - 16 Months - Hired After 8/1/08

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 55% of Journeyman's rate

Supplemental Rate Per Hour: \$34.81

Iron Worker (Ornamental) - 17 - 22 Months - Hired After 8/1/08

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 60% of Journeyperson's rate
Supplemental Rate Per Hour: \$35.78

Iron Worker (Ornamental) - 23 - 28 Months - Hired After 8/1/08

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 70% of Journeyperson's rate
Supplemental Rate Per Hour: \$37.72

Iron Worker (Ornamental) - 29 - 36 Months - Hired After 8/1/08

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 80% of Journeyperson's rate
Supplemental Rate Per Hour: \$39.66

(Local #580)

**IRON WORKER - STRUCTURAL
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 6)**

Iron Worker (Structural) - 1st Six Months

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$24.48
Supplemental Benefit Rate per Hour: \$43.87

Iron Worker (Structural) - 7- 18 Months

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$25.08
Supplemental Benefit Rate per Hour: \$43.87

Iron Worker (Structural) - 19 - 36 months

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$25.68
Supplemental Benefit Rate per Hour: \$43.87

(Local #40 and #361)

LABORER (FOUNDATION, CONCRETE, EXCAVATING, STREET PIPE LAYER & COMMON)

(Ratio Apprentice to Journeyperson: 1 to 1, 1 to 3)

Laborer (Foundation, Concrete, Excavating, Street Pipe Layer & Common) - First 1000 hours

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 50% of Journeyperson's rate
Supplemental Rate Per Hour: \$33.25

Laborer (Foundation, Concrete, Excavating, Street Pipe Layer & Common) - Second 1000 hours

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 60% of Journeyperson's rate
Supplemental Rate Per Hour: \$33.25

Laborer (Foundation, Concrete, Excavating, Street Pipe Layer & Common) - Third 1000 hours

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 75% of Journeyperson's rate
Supplemental Rate Per Hour: \$33.25

Laborer (Foundation, Concrete, Excavating, Street Pipe Layer & Common) - Fourth 1000 hours

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 90% of Journeyperson's rate
Supplemental Rate Per Hour: \$33.25

(Local #731)

MARBLE MECHANICS

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Cutters & Setters - First 750 Hours

Effective Period: 7/1/2013 - 6/30/2014

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

Wage and Supplemental Rate Per Hour: 50% of Journeyperson's rate

NO BENEFITS PAID DURING THE FIRST TWO MONTHS (PROBATIONARY PERIOD)

Cutters & Setters - Second 750 Hours

Effective Period: 7/1/2013 - 6/30/2014

Wage and Supplemental Rate Per Hour: 55% of Journeyperson's rate

Cutters & Setters - Third 750 Hours

Effective Period: 7/1/2013 - 6/30/2014

Wage and Supplemental Rate Per Hour: 65% of Journeyperson's rate

Cutters & Setters - Fourth 750 Hours

Effective Period: 7/1/2013 - 6/30/2014

Wage and Supplemental Rate Per Hour: 75% of Journeyperson's rate

Cutters & Setters - Fifth 750 Hours

Effective Period: 7/1/2013 - 6/30/2014

Wage and Supplemental Rate Per Hour: 85% of Journeyperson's rate

Cutters & Setters - Sixth 750 Hours

Effective Period: 7/1/2013 - 6/30/2014

Wage and Supplemental Rate Per Hour: 95% of Journeyperson's rate

Polishers & Finishers - First 750 Hours

Effective Period: 7/1/2013 - 6/30/2014

Wage and Supplemental Rate Per Hour: 50% of Journeyperson's rate

NO BENEFITS PAID DURING THE FIRST TWO MONTHS (PROBATIONARY PERIOD)

Polishers & Finishers - Second 750 Hours

Effective Period: 7/1/2013 - 6/30/2014

Wage and Supplemental Rate Per Hour: 60% of Journeyperson's rate

Polishers & Finishers - Third 750 Hours

Effective Period: 7/1/2013 - 6/30/2014

Wage and Supplemental Rate Per Hour: 75% of Journeyperson's rate

Polishers & Finishers - Fourth 750 Hours

Effective Period: 7/1/2013 - 6/30/2014

Wage and Supplemental Rate Per Hour: 90% of Journeyperson's rate

(Local #7)

MASON TENDER
(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 3)

Mason Tender - First Year

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$20.63
Supplemental Benefit Rate per Hour: \$17.06

Mason Tender - Second Year

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$21.73
Supplemental Benefit Rate per Hour: \$17.06

Mason Tender - Third Year

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$23.33
Supplemental Benefit Rate per Hour: \$17.06

Mason Tender - Fourth Year

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$25.93
Supplemental Benefit Rate per Hour: \$17.06

(Local #79)

METALLIC LATHER
(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 3)

Metallic Lather (First Year -Called Prior to 6/29/11)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$28.11

Supplemental Benefit Rate per Hour: \$22.79

Metallic Lather (Second Year - Called Prior to 6/29/11)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$32.71

Supplemental Benefit Rate per Hour: \$24.44

Metallic Lather (Third Year - Called Prior to 6/29/11)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$37.77

Supplemental Benefit Rate per Hour: \$25.59

Metallic Lather (First Year -Called On Or After 6/29/11)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$17.71

Supplemental Benefit Rate per Hour: \$19.85

Metallic Lather (Second Year - Called On Or After 6/29/11)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$22.81

Supplemental Benefit Rate per Hour: \$19.85

Metallic Lather (Third Year - Called On Or After 6/29/11)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$27.91

Supplemental Benefit Rate per Hour: \$19.85

(Local #46)

MILLWRIGHT

(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 4)

Millwright (First Year)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$26.23

Supplemental Benefit Rate per Hour: \$31.51

Millwright (Second Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$31.00
Supplemental Benefit Rate per Hour: \$34.77

Millwright (Third Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$35.77
Supplemental Benefit Rate per Hour: \$39.19

Millwright (Fourth Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$45.30
Supplemental Benefit Rate per Hour: \$44.63

(Local #740)

**PAVER AND ROADBUILDER
(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 3)**

Paver and Roadbuilder - First Year (Minimum 1000 hours)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$26.19
Supplemental Benefit Rate per Hour: \$16.20

Paver and Roadbuilder - Second Year (Minimum 1000 hours)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$27.77
Supplemental Benefit Rate per Hour: \$16.20

(Local #1010)

**PAINTER
(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 3)**

Painter - Brush & Roller - First Year

Effective Period: 7/1/2013 - 4/30/2014
Wage Rate per Hour: \$15.00
Supplemental Benefit Rate per Hour: \$11.38

Effective Period: 5/1/2014 - 6/30/2014
Wage Rate per Hour: \$15.80
Supplemental Benefit Rate per Hour: \$11.88

Painter - Brush & Roller - Second Year

Effective Period: 7/1/2013 - 4/30/2014
Wage Rate per Hour: \$18.75
Supplemental Benefit Rate per Hour: \$15.23

Effective Period: 5/1/2014 - 6/30/2014
Wage Rate per Hour: \$19.75
Supplemental Benefit Rate per Hour: \$15.73

Painter - Brush & Roller - Third Year

Effective Period: 7/1/2013 - 4/30/2014
Wage Rate per Hour: \$22.50
Supplemental Benefit Rate per Hour: \$18.14

Effective Period: 5/1/2014 - 6/30/2014
Wage Rate per Hour: \$23.70
Supplemental Benefit Rate per Hour: \$18.64

Painter - Brush & Roller - Fourth Year

Effective Period: 7/1/2013 - 4/30/2014
Wage Rate per Hour: \$30.00
Supplemental Benefit Rate per Hour: \$23.52

Effective Period: 5/1/2014 - 6/30/2014
Wage Rate per Hour: \$31.60
Supplemental Benefit Rate per Hour: \$24.02

(District Council of Painters)

PAINTER - STRUCTURAL STEEL
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Painters - Structural Steel (First Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage and Supplemental Rate Per Hour: 40% of Journeyperson's rate

Painters - Structural Steel (Second Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage and Supplemental Rate Per Hour: 60% of Journeyperson's rate

Painters - Structural Steel (Third Year)

Effective Period: 7/1/2013 - 6/30/2014
Wage and Supplemental Rate Per Hour: 80% of Journeyperson's rate

(Local #806)

PLASTERER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Plasterer - First Year: 1st Six Months

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 40% of Journeyperson's rate
Supplemental Rate Per Hour: \$12.76

Plasterer - First Year: 2nd Six Months

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 45% of Journeyperson's rate
Supplemental Rate Per Hour: \$13.24

Plasterer - Second Year: 1st Six Months

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 55% of Journeyperson's rate
Supplemental Rate Per Hour: \$15.21

Plasterer - Second Year: 2nd Six Months

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 60% of Journeyperson's rate
Supplemental Rate Per Hour: \$16.29

Plasterer - Third Year: 1st Six Months

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 70% of Journeyperson's rate
Supplemental Rate Per Hour: \$18.46

Plasterer - Third Year: 2nd Six Months

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 75% of Journeyperson's rate
Supplemental Rate Per Hour: \$19.54

(Local #530)

PLUMBER

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Plumber - First Year: 1st Six Months

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$14.00
Supplemental Benefit Rate per Hour: \$0.71

Plumber - First Year: 2nd Six Months

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$14.00
Supplemental Benefit Rate per Hour: \$2.96

Plumber - Second Year

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$18.26
Supplemental Benefit Rate per Hour: \$16.32

Plumber - Third Year

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$20.36
Supplemental Benefit Rate per Hour: \$16.32

Plumber - Fourth Year

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Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$23.21
Supplemental Benefit Rate per Hour: \$16.32

Plumber - Fifth Year: 1st Six Months

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$24.61
Supplemental Benefit Rate per Hour: \$16.32

Plumber - Fifth Year: 2nd Six Months

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$36.68
Supplemental Benefit Rate per Hour: \$16.32

(Plumbers Local #1)

POINTER - WATERPROOFER, CAULKER MECHANIC (EXTERIOR BUILDING RENOVATION)

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Pointer - Waterproofer, Caulker Mechanic - First Year

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$25.00
Supplemental Benefit Rate per Hour: \$3.64

Pointer - Waterproofer, Caulker Mechanic - Second Year

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$27.25
Supplemental Benefit Rate per Hour: \$8.59

Pointer - Waterproofer, Caulker Mechanic - Third Year

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$32.23
Supplemental Benefit Rate per Hour: \$11.34

Pointer - Waterproofer, Caulker Mechanic - Fourth Year

Effective Period: 7/1/2013 - 6/30/2014

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

Wage Rate per Hour: \$38.66

Supplemental Benefit Rate per Hour: \$11.34

(Bricklayer District Council)

ROOFER

(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 2)

Roofer - First Year

Effective Period: 7/1/2013 - 6/30/2014

Wage and Supplemental Rate Per Hour: 35% of Journeyman's Rate

Roofer - Second Year

Effective Period: 7/1/2013 - 6/30/2014

Wage and Supplemental Rate Per Hour: 50% of Journeyman's Rate

Roofer - Third Year

Effective Period: 7/1/2013 - 6/30/2014

Wage and Supplemental Rate Per Hour: 60% of Journeyman's Rate

Roofer - Fourth Year

Effective Period: 7/1/2013 - 6/30/2014

Wage and Supplemental Rate Per Hour: 75% of Journeyman's Rate

(Local #8)

SHEET METAL WORKER

(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 3)

Sheet Metal Worker - First Year

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate Per Hour: 30% of Journeyman's rate

Supplemental Rate Per Hour: \$15.37

Sheet Metal Worker - Second Year

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Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 35% of Journeyperson's rate
Supplemental Rate Per Hour: \$18.24

Sheet Metal Worker - Third Year (1st Six Months)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 40% of Journeyperson's rate
Supplemental Rate Per Hour: \$20.06

Sheet Metal Worker - Third Year (2nd Six Months)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 45% of Journeyperson's rate
Supplemental Rate Per Hour: \$21.87

Sheet Metal Worker - Fourth Year (1st Six Months)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 50% of Journeyperson's rate
Supplemental Rate Per Hour: \$23.69

Sheet Metal Worker - Fourth Year (2nd Six Months)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 55% of Journeyperson's rate
Supplemental Rate Per Hour: \$25.33

Sheet Metal Worker - Fifth Year (1st Six Months)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 60% of Journeyperson's rate
Supplemental Rate Per Hour: \$27.47

Sheet Metal Worker - Fifth Year(2nd Six Months)

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 70% of Journeyperson's rate
Supplemental Rate Per Hour: \$31.23

(Local #28)

SIGN ERECTOR

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Sign Erector - First Year: 1st Six Months

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 35% of Journeyperson's rate
Supplemental Rate Per Hour: \$5.96

Sign Erector - First Year: 2nd Six Months

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 40% of Journeyperson's rate
Supplemental Rate Per Hour: \$6.75

Sign Erector - Second Year: 1st Six Months

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 45% of Journeyperson's rate
Supplemental Rate Per Hour: \$7.55

Sign Erector - Second Year: 2nd Six Months

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 50% of Journeyperson's rate
Supplemental Rate Per Hour: \$8.34

Sign Erector - Third Year: 1st Six Months

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 55% of Journeyperson's rate
Supplemental Rate Per Hour: \$9.13

Sign Erector - Third Year: 2nd Six Months

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 60% of Journeyperson's rate
Supplemental Rate Per Hour: \$9.92

Sign Erector - Fourth Year: 1st Six Months

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 65% of Journeyperson's rate
Supplemental Rate Per Hour: \$10.72

Sign Erector - Fourth Year: 2nd Six Months

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 70% of Journeyperson's rate
Supplemental Rate Per Hour: \$11.51

Sign Erector - Fifth Year

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
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Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 75% of Journeyperson's rate
Supplemental Rate Per Hour: \$12.30

Sign Erector - Sixth Year

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate Per Hour: 80% of Journeyperson's rate
Supplemental Rate Per Hour: \$12.30

(Local #137)

STEAMFITTER

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Steamfitter - First Year

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate and Supplemental Per Hour: 40% of Journeyperson's rate

Steamfitter - Second Year

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate and Supplemental Rate Per Hour: 50% of Journeyperson's rate.

Steamfitter - Third Year

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate and Supplemental Rate per Hour: 65% of Journeyperson's rate.

Steamfitter - Fourth Year

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate and Supplemental Rate Per Hour: 80% of Journeyperson's rate.

Steamfitter - Fifth Year

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate and Supplemental Rate Per Hour: 85% of Journeyperson's rate.

(Local #638)

STONE MASON - SETTER

(Ratio Apprentice of Journeyman: 1 to 1, 1 to 2)

Stone Mason - Setters - First 750 Hours

Effective Period: 7/1/2013 - 6/30/2014

Wage and Supplemental Rate Per Hour: 50% of Journeyman's rate

Stone Mason - Setters - Second 750 Hours

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate Per Hour: 60% of Journeyman's rate

Supplemental Rate Per Hour: 50% of Journeyman's rate

Stone Mason - Setters - Third 750 Hours

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate Per Hour: 70% of Journeyman's rate

Supplemental Rate Per Hour: 50% of Journeyman's rate

Stone Mason - Setters - Fourth 750 Hours

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate Per Hour: 80% of Journeyman's rate

Supplemental Rate Per Hour: 50% of Journeyman's rate

Stone Mason - Setters - Fifth 750 Hours

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate Per Hour: 90% of Journeyman's rate

Supplemental Rate Per Hour: 50% of Journeyman's rate

Stone Mason - Setters - Sixth 750 Hours

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate Per Hour: 100% of Journeyman's rate

Supplemental Rate Per Hour: 50% of Journeyman's rate

(Bricklayers District Council)

TAPER

(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 4)

Drywall Taper - First Year

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Effective Period: 7/1/2013 - 6/30/2014
Wage and Supplemental Rate Per Hour: 40% of Journeyman's rate

Drywall Taper - Second Year

Effective Period: 7/1/2013 - 6/30/2014
Wage and Supplemental Rate Per Hour: 60% of Journeyman's rate

Drywall Taper - Third Year

Effective Period: 7/1/2013 - 6/30/2014
Wage and Supplemental Rate Per Hour: 80% of Journeyman's rate

(Local #1974)

TILE LAYER - SETTER
(Ratio of Apprentice to Journeyman: 1 to 1, 1 to 4)

Tile Layer - Setter - First 750 Hours

Effective Period: 7/1/2013 - 6/30/2014
Wage and Supplemental Rate Per Hour: 50% of Journeyman's rate

Tile Layer - Setter - Second 750 Hours

Effective Period: 7/1/2013 - 6/30/2014
Wage and Supplemental Rate Per Hour: 55% of Journeyman's rate

Tile Layer - Setter - Third 750 Hours

Effective Period: 7/1/2013 - 6/30/2014
Wage and Supplemental Rate Per Hour: 65% of Journeyman's rate

Tile Layer - Setter - Fourth 750 Hours

Effective Period: 7/1/2013 - 6/30/2014
Wage and Supplemental Rate Per Hour: 75% of Journeyman's rate

Tile Layer - Setter - Fifth 750 Hours

Effective Period: 7/1/2013 - 6/30/2014
Wage and Supplemental Rate Per Hour: 85% of Journeyman's rate

Tile Layer - Setter - Sixth 750 Hours

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§220 APPRENTICESHIP PREVAILING WAGE SCHEDULE

Effective Period: 7/1/2013 - 6/30/2014

Wage and Supplemental Rate Per Hour: 95% of Journeyperson's rate

(Local #7)

TIMBERPERSON

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 6)

Timberperson - First Year

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate Per Hour: 40% of Journeyperson's rate

Supplemental Rate Per Hour: \$30.04

Timberperson - Second Year

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate Per Hour: 50% of Journeyperson's rate

Supplemental Rate Per Hour: \$30.04

Timberperson - Third Year

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate Per Hour: 65% of Journeyperson's rate

Supplemental Rate Per Hour: \$30.04

Timberperson - Fourth Year

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate Per Hour: 80% of Journeyperson's rate

Supplemental Rate Per Hour: \$30.04

(Local #1536)

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LABOR LAW § 230 AND NYC ADMINISTRATIVE CODE § 6-130
BUILDING SERVICE EMPLOYEES

PREVAILING WAGE FOR BUILDING SERVICE EMPLOYEES ON NYC CONTRACTS PURSUANT TO
LABOR LAW § 230 ET SEQ.

Building service employees on public contracts must receive not less than the prevailing rate of wage and supplements for the classification of work performed. In accordance with Labor Law §230 et seq. the Comptroller of the City of New York has promulgated this schedule of prevailing wages and supplemental benefits for building service employees engaged on New York City public building service contracts in excess of \$1,500.00. Prevailing rates are required to be annexed to and form part of the contract pursuant to §231 (4).

Contracting agencies that anticipate doing work that may require building service trades or classifications not included in this schedule may request the Comptroller to establish a proper classification and wage determination for the work. Contractors using trades and/or classifications for which the Comptroller has not promulgated wages and benefits do so at their own risk.

Contractors are advised to review the applicable Comptroller's Prevailing Wage Schedule before bidding on public work. Any Prevailing Wage Rate error made by the Contracting Agency, whether in a contract document or other communication, will not preclude a finding against the contractor of a prevailing-wage violation.

PREVAILING WAGE FOR BUILDING SERVICE EMPLOYEES IN NEW YORK CITY LEASED OR
FINANCIALLY ASSISTED FACILITIES PURSUANT TO NYC ADMINISTRATIVE CODE § 6-130

Covered landlords & covered financial assistance recipients shall ensure that all building service employees performing building service work at the premises to which a lease or financial assistance pertains are paid no less than the prevailing wage listed in the Labor Law §230 Prevailing Wage Schedule.

Covered Landlords include:

Businesses (other than not-for-profit organizations) leasing to New York City agencies commercial office space or commercial office facilities of 10,000 square feet or more where the City leases or rents no less than 51% of the total square footage of the building to which the lease applies (no less than 80% in Staten Island or in an area not defined as an exclusion area pursuant to section 421-a of the real property tax law on the date of enactment of the local law).

Covered Financial Assistance Recipients include:

Businesses (other than not-for-profit organizations) with annual gross revenues of five million dollars or more who have received financial assistance from the City of New York (as defined in New York City Administrative Code §6-130) with a total value of one million dollars or more.

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§230 PREVAILING WAGE SCHEDULE

Exemptions: Business Improvement Districts and employers with manufacturing operations at the premises to which the financial assistance pertains.

The information is intended to assist you in meeting your prevailing wage obligation. You should consult New York City Administrative Code §6-130 to determine whether you are covered by this prevailing wage law. New York City Administrative Code § 6-130 requires the City to maintain an updated list of covered landlords and financial assistance recipients who are subject to the prevailing wage requirement.

Labor Law § 231 (6) and NYC Administrative Law §6-130 require contractors to post on the site of the work a current copy of this schedule of wages and supplements.

This schedule is applicable to work performed during the effective period, unless otherwise noted. Changes to this schedule are published on our web site www.comptroller.nyc.gov. Contractors must pay the wages and supplements in effect when the building service employee performs the work. Preliminary schedules for future one-year periods appear in the City Record on or about June 1 each succeeding year. Final schedules appear on or about July 1 in the City Record and on our web site www.comptroller.nyc.gov.

Contractors are solely responsible for maintaining original payroll records delineating, among other things, the hours worked by each employee within a given classification.

Some of the rates in this schedule are based on collective bargaining agreements. The Comptroller's Office has attempted to include all overtime, shift and night differential, Holiday, Saturday, Sunday or other premium time work. However, this schedule does not set forth every prevailing practice with respect to such rates with which employers must comply. All such practices are nevertheless part of the employer's prevailing wage obligation and contained in the collective bargaining agreements of the prevailing wage unions. These collective bargaining agreements are available for inspection by appointment. Requests for appointments may be made by calling (212) 669-4443, Monday through Friday between the hours of 9 a.m. and 5 p.m.

Answers to questions concerning prevailing trade practices may be obtained from the Classification Unit by calling (212) 669-7974. Please direct all other compliance issues to: Bureau of Labor Law, Attn: Wasyl Kinach, P.E., Office of the Comptroller, 1 Centre Street, Room 1122, New York, N.Y. 10007; Fax (212) 669-4002.

In order to meet their obligation to provide prevailing supplemental benefits to each covered employee, employers must either:

- 1) Provide bona-fide benefits which cost the employer no less than the prevailing supplemental benefits rate; or
- 2) Supplement the employee's hourly wage by an amount no less than the prevailing supplemental benefits rate; or
- 3) Provide a combination of bona-fide benefits and wage supplements which cost the employer no less than the prevailing supplemental benefits rate in total.

Benefits are paid for EACH HOUR WORKED unless otherwise noted.

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§230 PREVAILING WAGE SCHEDULE



Office of the Comptroller
BUREAU OF LABOR LAW

CITY OF NEW YORK
OFFICE OF THE COMPTROLLER
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TEL: (212) 669-4443
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If you are a Covered Building Service Employee and you have been paid less than the Prevailing Wage and Benefits, please contact us at 212-669-4443 or download our complaint form from our website at WWW.COMPTROLLER.NYC.GOV (click on the Bureau of Labor Law).

Si es un empleado de servicios a edificios elegible y recibió menos del sueldo prevalente y beneficios, por favor contáctenos en 212-669-4443 o descarga un formulario de reclamo del sitio del Internet WWW.COMPTROLLER.NYC.GOV (oprime "Oficina de Derecho Laboral").

Wasył Kinach, P.E.
Director of Classifications
Bureau of Labor Law

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BOILER SERVICE PERSON/TANK CLEANER MECHANIC (LOW PRESSURE)

Boiler Service Person/Tank Cleaner Mechanic (Low Pressure)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$11.37

Supplemental Benefit Rate per Hour: \$5.57

Overtime Description

Work in excess of 8 hours performed on a Sunday or Holiday shall be paid two and one half times the regular rate.

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Double time the regular rate for work on the following holiday(s).

Paid Holidays

- New Year's Day
- Martin Luther King Jr. Day
- President's Day
- Good Friday
- Memorial Day
- Independence Day
- Labor Day
- Columbus Day
- Thanksgiving Day
- Day after Thanksgiving
- Christmas Day
- Employee's Birthday

Vacation

1 year service.....	five (5) days
3 years service or more.....	ten (10) days
8 years service or more.....	fifteen (15) days
13 years service or more.....	twenty (20) days

SICK LEAVE:

1-2 years employment.....	4 days
2-3 years employment.....	5 days
3-4 years employment.....	6 days
4-5 years employment.....	8 days
6 years or more employment.....	10 days

(Local #32 B/J)

BUILDING CLEANER AND MAINTAINER (OFFICE)

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§230 PREVAILING WAGE SCHEDULE

Office Building Class "A" Handyperson (Over 280,000 square feet gross area)

Effective Period: 7/1/2013 - 12/31/2013

Wage Rate per Hour: **\$25.10**

Supplemental Benefit Rate per Hour: **\$9.51**

Effective Period: 1/1/2014 - 6/30/2014

Wage Rate per Hour: **\$25.55**

Supplemental Benefit Rate per Hour: **\$9.91**

Office Building Class "A" Foreperson, Starter (Over 280,000 square feet gross area)

Effective Period: 7/1/2013 - 12/31/2013

Wage Rate per Hour: **\$24.99**

Supplemental Benefit Rate per Hour: **\$9.51**

Effective Period: 1/1/2014 - 6/30/2014

Wage Rate per Hour: **\$25.44**

Supplemental Benefit Rate per Hour: **\$9.91**

Office Building Class "A" Cleaner/Porter, Elevator Operator, Exterminator, Fire Safety Director (Over 280,000 square feet gross area)

Effective Period: 7/1/2013 - 12/31/2013

Wage Rate per Hour: **\$22.97**

Supplemental Benefit Rate per Hour: **\$9.51**

Supplemental Note: for new employee 0-12 months of employment - \$6.92; for new employee 13-24 months of employment - \$9.18

NEW HIRE: Cleaner/Porter, Elevator Operator, Exterminator, Fire Safety Director may be paid 75% of the wage rate above for the first 21 months of employment, 85% of the wage rate above for the 22nd through 42nd months of employment, and upon the completion of 42 months of employment employee shall be paid the full wage rate. Note: New Hires hired before January 1, 2012 will continue to receive 80% of the wage rate above for the first 30 months, and upon the completion of 30 months of employment employee shall be paid the full wage rate. Upon completion of two years of employment the new hire receives the full supplemental benefit rate.

Effective Period: 1/1/2014 - 6/30/2014

Wage Rate per Hour: **\$23.42**

Supplemental Benefit Rate per Hour: **\$9.91**

Supplemental Note: for new employee 0-12 months of employment - \$7.22; for new employee 13-24 months of employment - \$9.58

NEW HIRE: Cleaner/Porter, Elevator Operator, Exterminator, Fire Safety Director may be paid 75% of the wage rate above for the first 21 months of employment, 85% of the wage rate above for the 22nd through 42nd months of employment, and upon the completion of 42 months of employment employee shall be paid the full wage rate. Note: New Hires hired before January 1, 2012 will continue to receive 80% of the wage rate above for the first 30 months, and upon the completion of 30 months of employment employee shall be paid the full wage rate. Upon completion of two years of employment the new hire receives the full supplemental benefit rate.

Office Building Class "B" Handyperson (Over 120,000 and less than 280,000 square feet gross area)

Effective Period: 7/1/2013 - 12/31/2013
Wage Rate per Hour: **\$25.07**
Supplemental Benefit Rate per Hour: **\$9.51**

Effective Period: 1/1/2014 - 6/30/2014
Wage Rate per Hour: **\$25.52**
Supplemental Benefit Rate per Hour: **\$9.91**

Office Building Class "B" Foreperson, Starter (Over 120,000 and less than 280,000 square feet gross area)

Effective Period: 7/1/2013 - 12/31/2013
Wage Rate per Hour: **\$24.95**
Supplemental Benefit Rate per Hour: **\$9.51**

Effective Period: 1/1/2014 - 6/30/2014
Wage Rate per Hour: **\$25.40**
Supplemental Benefit Rate per Hour: **\$9.91**

Office Building Class "B" Cleaner/Porter, Elevator Operator, Exterminator, Fire Safety Director (Over 120,000 and less than 280,000 square feet gross area)

Effective Period: 7/1/2013 - 12/31/2013
Wage Rate per Hour: **\$22.94**
Supplemental Benefit Rate per Hour: **\$9.51**
Supplemental Note: for new employee 0-12 months of employment - \$6.92; for new employee 13-24 months of employment - \$9.18

NEW HIRE: Cleaner/Porter, Elevator Operator, Exterminator, Fire Safety Director may be paid 75% of the wage rate above for the first 21 months of employment, 85% of the wage rate above for the 22nd through 42nd months of employment, and upon the completion of 42 months of employment employee shall be paid the full wage rate. Note: New Hires hired before January 1, 2012 will continue to receive 80% of the wage rate above for the first 30 months, and upon the completion of 30 months of employment employee shall be paid the full wage rate. Upon completion of two years of employment the new hire receives the full supplemental benefit rate.

Effective Period: 1/1/2014 - 6/30/2014
Wage Rate per Hour: **\$23.39**
Supplemental Benefit Rate per Hour: **\$9.91**
Supplemental Note: for new employee 0-12 months of employment - \$7.22; for new employee 13-24 months of employment - \$9.58

NEW HIRE: Cleaner/Porter, Elevator Operator, Exterminator, Fire Safety Director may be paid 75% of the wage rate above for the first 21 months of employment, 85% of the wage rate above for the 22nd through 42nd months of employment, and upon the completion of 42 months of employment employee shall be paid the full wage rate. Note: New Hires hired before January 1, 2012 will continue to receive 80% of the wage rate above for the first 30 months, and upon the completion of 30 months of employment employee shall be paid the full wage rate. Upon completion of two years of employment the new hire receives the full supplemental benefit rate.

Office Building Class "C" Handyperson (Less than 120,000 square feet gross area)

Effective Period: 7/1/2013 - 12/31/2013
Wage Rate per Hour: \$25.02
Supplemental Benefit Rate per Hour: \$9.51

Effective Period: 1/1/2014 - 6/30/2014
Wage Rate per Hour: \$25.47
Supplemental Benefit Rate per Hour: \$9.91

Office Building Class "C" Foreperson, Starter (Less than 120,000 square feet gross area)

Effective Period: 7/1/2013 - 12/31/2013
Wage Rate per Hour: \$24.91
Supplemental Benefit Rate per Hour: \$9.51

Effective Period: 1/1/2014 - 6/30/2014
Wage Rate per Hour: \$25.36
Supplemental Benefit Rate per Hour: \$9.91

Office Building Class "C" Cleaner/Porter, Elevator Operator, Exterminator, Fire Safety Director (Less than 120,000 square feet gross area)

Effective Period: 7/1/2013 - 12/31/2013
Wage Rate per Hour: \$22.90
Supplemental Benefit Rate per Hour: \$9.51
Supplemental Note: for new employee 0-12 months of employment - \$6.92; for new employee 13-24 months of employment - \$9.18

NEW HIRE: Cleaner/Porter, Elevator Operator, Exterminator, Fire Safety Director may be paid 75% of the wage rate above for the first 21 months of employment, 85% of the wage rate above for the 22nd through 42nd months of employment, and upon the completion of 42 months of employment employee shall be paid the full wage rate. Note: New Hires hired before January 1, 2012 will continue to receive 80% of the wage rate above for the first 30 months, and upon the completion of 30 months of employment employee shall be paid the full wage rate. Upon completion of two years of employment the new hire receives the full supplemental benefit rate.

Effective Period: 1/1/2014 - 6/30/2014
Wage Rate per Hour: \$23.35
Supplemental Benefit Rate per Hour: \$9.91
Supplemental Note: for new employee 0-12 months of employment - \$7.22; for new employee 13-24 months of employment - \$9.58

NEW HIRE: Cleaner/Porter, Elevator Operator, Exterminator, Fire Safety Director may be paid 75% of the wage rate above for the first 21 months of employment, 85% of the wage rate above for the 22nd through 42nd months of employment, and upon the completion of 42 months of employment employee shall be paid the full wage rate. Note: New Hires hired before January 1, 2012 will continue to receive 80% of the wage rate above for the first 30 months, and upon the completion of 30 months of employment employee shall be paid the full wage rate. Upon completion of two years of employment the new hire receives the full supplemental benefit rate.

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for work on a holiday plus the day's pay.
Time and one half the regular hourly rate after 40 hours in any work week.

Paid Holidays

New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Vacation

Less than 6 months of work.....no vacation
6 months of work.....three (3) days
1 year of work.....ten (10) days
5 years of work.....fifteen (15) days
15 years of work.....twenty (20) days
21 years of work.....twenty-one (21) days
22 years of work.....twenty-two (22) days
23 years of work.....twenty-three (23) days
24 years of work.....twenty-four (24) days
25 years or more of work.....twenty-five (25) days
Plus two Personal Days per year.

Sick Leave:

10 sick days per year.
Unused sick leave paid in the succeeding January, one full day pay for each unused sick day.

(Local #32 B/J)

BUILDING CLEANER AND MAINTAINER (RESIDENTIAL)

Residential Building Class "A" Handyperson

Residential Buildings Class "A": buildings where the assessed value of the land and building, based upon the 1935 assessment, divided by the number of rooms in the building, gives an assessed value of over \$4000.00 a room.

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$23.57

Supplemental Benefit Rate per Hour: \$9.43

Supplemental Note: Effective 1/1/2014 - \$9.83

Residential Building Class "A" Cleaner/Porter

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§230 PREVAILING WAGE SCHEDULE

Residential Buildings Class "A": buildings where the assessed value of the land and building, based upon the 1935 assessment, divided by the number of rooms in the building, gives an assessed value of over \$4000.00 a room.

Effective Period: 7/1/2013 - 12/31/2013

Wage Rate per Hour: \$21.34

Supplemental Benefit Rate per Hour: \$9.43

Supplemental Note: for new employee 0-12 months of employment - \$6.92; for new employee 13-24 months of employment - \$9.18

NEW HIRE: Porter/Cleaner, may be paid a starting rate of 80% of the hourly rate published above. Upon completion of 30 months of employment, the new hire shall be paid the full wage rate. Upon completion of two years of employment the new hire receives the full supplemental benefit rate.

Effective Period: 1/1/2014 - 6/30/2014

Wage Rate per Hour: \$21.34

Supplemental Benefit Rate per Hour: \$9.83

Supplemental Note: for new employee 0-12 months of employment - \$7.22; for new employee 13-24 months of employment - \$9.58

NEW HIRE: Porter/Cleaner, may be paid a starting rate of 80% of the hourly rate published above. Upon completion of 30 months of employment, the new hire shall be paid the full wage rate. Upon completion of two years of employment the new hire receives the full supplemental benefit rate.

Residential Building Class "B" Handyman

Residential Building Class "B": buildings where the assessed value of the land and building, based upon the 1935 assessment, divided by the number of rooms in the building, gives an assessed value of over \$2000.00 a room and not over \$4000.00 a room.

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$23.51

Supplemental Benefit Rate per Hour: \$9.43

Supplemental Note: Effective 1/1/2014 - \$9.83

Residential Building Class "B" Cleaner/Porter

Residential Building Class "B": buildings where the assessed value of the land and building, based upon the 1935 assessment, divided by the number of rooms in the building, gives an assessed value of over \$2000.00 a room and not over \$4000.00 a room.

Effective Period: 7/1/2013 - 12/31/2013

Wage Rate per Hour: \$21.28

Supplemental Benefit Rate per Hour: \$9.43

Supplemental Note: for new employee 0-12 months of employment - \$6.92; for new employee 13-24 months of employment - \$9.18

NEW HIRE: Porter/Cleaner, may be paid a starting rate of 80% of the hourly rate published above. Upon completion of 30 months of employment, the new hire shall be paid the full wage rate. Upon completion of two years of employment the new hire receives the full supplemental benefit rate.

Effective Period: 1/1/2014 - 6/30/2014

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§230 PREVAILING WAGE SCHEDULE

Wage Rate per Hour: **\$21.28**

Supplemental Benefit Rate per Hour: **\$9.83**

Supplemental Note: for new employee 0-12 months of employment - \$7.22; for new employee 13-24 months of employment - \$9.58

NEW HIRE: Porter/Cleaner, may be paid a starting rate of 80% of the hourly rate published above. Upon completion of 30 months of employment, the new hire shall be paid the full wage rate. Upon completion of two years of employment the new hire receives the full supplemental benefit rate.

Residential Building Class "C" Handyperson

Residential Building Class "C": buildings where the assessed value of the land and building, based upon the 1935 assessment, divided by the number of rooms in the building, gives an assessed value of \$2000.00 or less a room.

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: **\$23.45**

Supplemental Benefit Rate per Hour: **\$9.43**

Supplemental Note: Effective 1/1/2014 - \$9.83

Residential Building Class "C" Cleaner/Porter

Residential Building Class "C": buildings where the assessed value of the land and building, based upon the 1935 assessment, divided by the number of rooms in the building, gives an assessed value of \$2000.00 or less a room.

Effective Period: 7/1/2013 - 12/31/2013

Wage Rate per Hour: **\$21.23**

Supplemental Benefit Rate per Hour: **\$9.43**

Supplemental Note: for new employee 0-12 months of employment - \$6.92; for new employee 13-24 months of employment - \$9.18

NEW HIRE: Porter/Cleaner, may be paid a starting rate of 80% of the hourly rate published above. Upon completion of 30 months of employment, the new hire shall be paid the full wage rate. Upon completion of two years of employment the new hire receives the full supplemental benefit rate.

Effective Period: 1/1/2014 - 6/30/2014

Wage Rate per Hour: **\$21.23**

Supplemental Benefit Rate per Hour: **\$9.83**

Supplemental Note: for new employee 0-12 months of employment - \$7.22; for new employee 13-24 months of employment - \$9.58

NEW HIRE: Porter/Cleaner, may be paid a starting rate of 80% of the hourly rate published above. Upon completion of 30 months of employment, the new hire shall be paid the full wage rate. Upon completion of two years of employment the new hire receives the full supplemental benefit rate.

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for work on a holiday plus the day's pay.

Time and one half the regular hourly rate after 40 hours in any work week.

Paid Holidays

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§230 PREVAILING WAGE SCHEDULE

New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Election Day
Thanksgiving Day
Christmas Day

Vacation

6 months.....three (3) days
1 year.....ten (10) days
5 years.....fifteen (15) days
15 years.....twenty (20) days
21 years.....twenty-one (21) days
22 years.....twenty-two (22) days
23 years.....twenty-three (23) days
24 years.....twenty-four (24) days
25 years.....twenty-five (25) days
Plus two Personal Days per year.

SICK LEAVE

After 1 year of service.....ten (10) days per year

(Local #32 B/J)

BUILDING HVAC SERVICES OPERATOR

Engineer (Refrigeration)

Effective Period: 7/1/2013 - 12/31/2013

Wage Rate per Hour: **\$35.18**

Supplemental Benefit Rate per Hour: **\$15.78**

Effective Period: 1/1/2014 - 6/30/2014

Wage Rate per Hour: **\$36.73**

Supplemental Benefit Rate per Hour: **\$16.35**

Fireperson

Fireperson (Helper): Assist the Engineer

Effective Period: 7/1/2013 - 12/31/2013

Wage Rate per Hour: **\$27.39**

Supplemental Benefit Rate per Hour: **\$15.41**

Effective Period: 1/1/2014 - 6/30/2014

Wage Rate per Hour: **\$28.60**

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§230 PREVAILING WAGE SCHEDULE

Supplemental Benefit Rate per Hour: \$15.97

Overtime Description

All hours worked on a holiday shall be paid at two and one half times the regular wage rate in lieu of the paid day off.

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.

Paid Holidays

New Year's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day
Plus six (6) floating Holidays

Vacation

6 months three (3) days
1 year ten (10) days
5 years fifteen (15) days
15 years twenty (20) days
21 years twenty-one (21) days
22 years twenty-two (22) days
23 years twenty-three (23) days
24 years twenty-four (24) days
25 years twenty-five (25) days

(Local #94)

CLEANER (PARKING GARAGE)

Garage Cleaner

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$11.20
Supplemental Benefit Rate per Hour: \$1.72

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular hourly rate after 40 hours in any work week.

(Based on data from NYS Department of Labor Occupational Employment Statistics and US Department of Labor Bureau of Labor Statistics)

FUEL OIL

Fuel Oil, Coal, Fuel Gas, Petroleum Product Chauffeur (5th Year and above)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$30.61

Supplemental Benefit Rate per Hour: \$20.42

Fuel Oil, Coal, Fuel Gas, Petroleum Product Chauffeur (4th Year)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$28.00

Supplemental Benefit Rate per Hour: \$20.42

Fuel Oil, Coal, Fuel Gas, Petroleum Product Chauffeur (3rd Year)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$26.00

Supplemental Benefit Rate per Hour: \$20.42

Fuel Oil, Coal, Fuel Gas, Petroleum Product Chauffeur (2nd Year)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$24.00

Supplemental Benefit Rate per Hour: \$20.42

Fuel Oil, Coal, Fuel Gas, Petroleum Product Chauffeur (1st Year)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$22.00

Supplemental Benefit Rate per Hour: \$20.42

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).

Martin Luther King Jr. Day

Lincoln's Birthday

Washington's Birthday

Memorial Day

Independence Day

Labor Day

Columbus Day

Election Day

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
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Veteran's Day

Triple time the regular rate for work on the following holiday(s).

New Year's Day
Thanksgiving Day
Christmas Day

Paid Holidays

New Year's Day
Martin Luther King Jr. Day
Lincoln's Birthday
Washington's Birthday
Memorial Day
Independence Day
Labor Day
Columbus Day
Election Day
Veteran's Day
Thanksgiving Day
Christmas Day

Vacation

Less than 75 days worked.....no vacation.
75 days worked, but less than 110 days worked in a calendar year.....five (5) days the following year.
110 days or more worked in a calendar year.....ten (10) days the following year.

SICK LEAVE:

1 day sick leave earned for each 40 days worked in the preceding calendar year for a maximum of five (5) days per calendar year.

(Local #553)

GARDENER

Gardener

Effective Period: 7/1/2013 - 6/30/2014
Wage Rate per Hour: \$17.16
Supplemental Benefit Rate per Hour: \$1.72

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular hourly rate after 40 hours in any work week.

(Based on data from NYS Department of Labor Occupational Employment Statistics and US Department of Labor Bureau of Labor Statistics)

LOCKSMITH

Locksmith

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$19.63

Supplemental Benefit Rate per Hour: \$6.20

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular hourly rate after 40 hours in any work week.

(Based on data from NYS Department of Labor Occupational Employment Statistics and US Department of Labor Bureau of Labor Statistics)

MEDICAL WASTE REMOVAL

Driver

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$18.00

Supplemental Benefit Rate per Hour: \$9.34

Helper

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$14.25

Supplemental Benefit Rate per Hour: \$9.34

Tractor Trailer Driver

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$20.50

Supplemental Benefit Rate per Hour: \$9.34

Overtime Description

Time and one half the regular hourly rate after an 8 hour day or after 40 hours in any work week. The seventh day of work in a workweek is paid at double time the regular hourly rate. Time and one half the regular hourly rate for work on a holiday plus days pay for below paid holidays.

Paid Holidays

President's Day

Memorial Day

Independence Day

Labor Day

Thanksgiving Day

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
\$230 PREVAILING WAGE SCHEDULE

Christmas Day

Vacation

1 year of service but less than five years.....	ten (10) days
5 years of service but less than ten years.....	fifteen (15) days
10 years of service.....	sixteen (16) days
11 years.....	seventeen (17) days
12 years.....	eighteen (18) days
13 years.....	nineteen (19) days
14 years.....	twenty (20) days
20 years.....	twenty-one (21) days
21 years.....	twenty-two (22) days
22 years.....	twenty-three (23) days
23 years.....	twenty-four (24) days
24 years.....	twenty-five (25) days

Plus 5 Personal Days

(Local #813)

MOVER - OFFICE FURNITURE AND EQUIPMENT

Heavy and Tractor Trailer Truck Driver

Tractor-trailer combination or a truck with a capacity of at least 26,000 pounds Gross Vehicle Weight (GVW)

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$22.57

Supplemental Benefit Rate per Hour: \$4.49

Light Truck Driver

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$19.81

Supplemental Benefit Rate per Hour: \$4.49

Laborer and Freight, Stock, and Material Movers, Hand

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$17.51

Supplemental Benefit Rate per Hour: \$4.49

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular hourly rate after 40 hours in any work week.

(Based on data from NYS Department of Labor Occupational Employment Statistics and US Department of Labor Bureau of Labor Statistics)

REFUSE REMOVER

Refuse Remover

Effective Period: 7/1/2013 - 6/30/2014

Wage Rate per Hour: \$29.27

Supplemental Benefit Rate per Hour: \$4.49

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular hourly rate after 40 hours in any work week.

(Based on data from NYS Department of Labor Occupational Employment Statistics and US Department of Labor Bureau of Labor Statistics)

SECURITY GUARD (ARMED)

Security Guard (Armed)

Effective Period: 7/1/2013 - 12/31/2013

Wage Rate per Hour: \$28.00

Supplemental Benefit Rate per Hour: \$4.90

Supplemental Note: for new employee 0-30 days of employment - \$4.26; for new employee 31-120 days of employment - \$4.43; for new employee 121 days - 2 years of employment - \$4.54

Effective Period: 1/1/2014 - 6/30/2014

Wage Rate per Hour: \$28.25

Supplemental Benefit Rate per Hour: \$5.02

Supplemental Note: for new employee 0-30 days of employment - \$4.44; for new employee 31-120 days of employment - \$4.61; for new employee 121 days - 2 years of employment - \$4.63

Months of employment shall be defined as an Employee's length of service with the Employer or at the Facility, whichever is greater.

Overtime Description

A guard who works a holiday is paid the regular rate plus receives the paid holiday.

Supplemental Benefits shall be paid for each hour paid, up to forty (40) paid hours per week.

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular hourly rate after 40 hours in any work week.

Paid Holidays

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§230 PREVAILING WAGE SCHEDULE

New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day
Personal Day

Vacation

Months on payroll	Vacation with Pay
6	3 days
12	5 days
24	10 days
60	15 days
180	20 days
300	25 days

Sick Leave

Employees accrue paid sick leave at the rate of one (1) sick day for every six (6) months worked, up to a maximum of six (6) days a year.

(Local #32B/J)

SECURITY GUARD (UNARMED)

Security Guard (Unarmed) 0 - 6 months

Effective Period: 7/1/2013 - 12/31/2013

Wage Rate per Hour: \$12.85

Supplemental Benefit Rate per Hour: \$4.54

Supplemental Note: for new employee 0-30 days of employment - \$4.26; for new employee 31-120 days of employment - \$4.43

Effective Period: 1/1/2014 - 6/30/2014

Wage Rate per Hour: \$13.10

Supplemental Benefit Rate per Hour: \$4.63

Supplemental Note: for new employee 0-30 days of employment - \$4.44; for new employee 31-120 days of employment - \$4.61

Security Guard (Unarmed) 7 - 12 months

Effective Period: 7/1/2013 - 12/31/2013

Wage Rate per Hour: \$13.35

Supplemental Benefit Rate per Hour: \$4.54

Effective Period: 1/1/2014 - 6/30/2014

Wage Rate per Hour: \$13.60

Supplemental Benefit Rate per Hour: \$4.63

Security Guard (Unarmed) 13 - 18 months

Effective Period: 7/1/2013 - 12/31/2013
Wage Rate per Hour: \$13.85
Supplemental Benefit Rate per Hour: \$4.54

Effective Period: 1/1/2014 - 6/30/2014
Wage Rate per Hour: \$14.10
Supplemental Benefit Rate per Hour: \$4.63

Security Guard (Unarmed) 19 - 24 months

Effective Period: 7/1/2013 - 12/31/2013
Wage Rate per Hour: \$14.35
Supplemental Benefit Rate per Hour: \$4.54

Effective Period: 1/1/2014 - 6/30/2014
Wage Rate per Hour: \$14.60
Supplemental Benefit Rate per Hour: \$4.63

Security Guard (Unarmed) 25 - 30 months

Effective Period: 7/1/2013 - 12/31/2013
Wage Rate per Hour: \$14.85
Supplemental Benefit Rate per Hour: \$4.90

Effective Period: 1/1/2014 - 6/30/2014
Wage Rate per Hour: \$15.10
Supplemental Benefit Rate per Hour: \$5.02

Security Guard (Unarmed) 31 months or more

Effective Period: 7/1/2013 - 12/31/2013
Wage Rate per Hour: \$15.15
Supplemental Benefit Rate per Hour: \$4.90

Effective Period: 1/1/2014 - 6/30/2014
Wage Rate per Hour: \$15.60
Supplemental Benefit Rate per Hour: \$5.02

Months of employment shall be defined as an Employee's length of service with the Employer or at the Facility, whichever is greater.

Overtime Description

A guard who works a holiday is paid the regular rate plus receives the paid holiday.
Supplemental Benefits shall be paid for each hour paid, up to forty (40) paid hours per week.

Overtime

Time and one half the regular rate after an 8 hour day.

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§230 PREVAILING WAGE SCHEDULE

Time and one half the regular hourly rate after 40 hours in any work week.

Paid Holidays

- New Year's Day
- President's Day
- Memorial Day
- Independence Day
- Labor Day
- Thanksgiving Day
- Christmas Day
- Personal Day

Vacation

Months on payroll	Vacation with Pay
6	3 days
12	5 days
24	10 days
60	15 days
180	20 days
300	25 days

Sick Leave

Employees accrue paid sick leave at the rate of one (1) sick day for every six (6) months worked, up to a maximum of six (6) days a year.

(Local #32B/J)

WINDOW CLEANER

Window Cleaner

Effective Period: 7/1/2013 - 12/31/2013

Wage Rate per Hour: **\$26.44**

Supplemental Benefit Rate per Hour: **\$9.51**

Effective Period: 1/1/2014 - 6/30/2014

Wage Rate per Hour: **\$26.90**

Supplemental Benefit Rate per Hour: **\$9.91**

Power Operated Scaffolds, Manual Scaffolds, and Boatswain Chairs

Effective Period: 7/1/2013 - 12/31/2013

Wage Rate per Hour: **\$28.69**

Supplemental Benefit Rate per Hour: **\$9.51**

Effective Period: 1/1/2014 - 6/30/2014

Wage Rate per Hour: **\$29.27**

Supplemental Benefit Rate per Hour: **\$9.91**

Window Cleaner Apprentice (0 - 3 months)

Effective Period: 7/1/2013 - 12/31/2013
Wage Rate per Hour: **\$19.59**
Supplemental Benefit Rate per Hour: None

Effective Period: 1/1/2014 - 6/30/2014
Wage Rate per Hour: **\$19.92**
Supplemental Benefit Rate per Hour: None

Window Cleaner Apprentice (4 - 7 months)

Employee must be a registered apprentice with the New York State Department of Labor

Effective Period: 7/1/2013 - 12/31/2013
Wage Rate per Hour: **\$21.18**
Supplemental Benefit Rate per Hour: **\$9.51**

Effective Period: 1/1/2014 - 6/30/2014
Wage Rate per Hour: **\$21.54**
Supplemental Benefit Rate per Hour: **\$9.91**

Window Cleaner Apprentice (8 - 11 months)

Effective Period: 7/1/2013 - 12/31/2013
Wage Rate per Hour: **\$22.44**
Supplemental Benefit Rate per Hour: **\$9.51**

Effective Period: 1/1/2014 - 6/30/2014
Wage Rate per Hour: **\$22.82**
Supplemental Benefit Rate per Hour: **\$9.91**

Window Cleaner Apprentice (12 - 15 months)

Effective Period: 7/1/2013 - 12/31/2013
Wage Rate per Hour: **\$23.72**
Supplemental Benefit Rate per Hour: **\$9.51**

Effective Period: 1/1/2014 - 6/30/2014
Wage Rate per Hour: **\$24.12**
Supplemental Benefit Rate per Hour: **\$9.91**

Window Cleaner Apprentice (16 - 17 months)

Effective Period: 7/1/2013 - 12/31/2013
Wage Rate per Hour: **\$25.01**
Supplemental Benefit Rate per Hour: **\$9.51**

Effective Period: 1/1/2014 - 6/30/2014

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
§230 PREVAILING WAGE SCHEDULE

Wage Rate per Hour: \$25.44

Supplemental Benefit Rate per Hour: \$9.91

Overtime

Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.

Double time the regular rate for Sunday.

Time and one half the regular rate for work on a holiday plus the day's pay.

Paid Holidays

- New Year's Day
- Martin Luther King Jr. Day
- President's Day
- Good Friday
- Memorial Day
- Independence Day
- Labor Day
- Columbus Day
- Thanksgiving Day
- Day after Thanksgiving
- Christmas Day
- Personal Day

Vacation

After 7 months but less than 1 year of service.....	five (5) days
1 year but less than 5 years of service.....	ten (10) days
5 years of service but less than 15 years of service.....	fifteen (15) days
15 years of service but less than 21 years of service.....	twenty (20) days
21 years.....	twenty-one (21) days
22 years.....	twenty-two (22) days
23 years.....	twenty-three (23) days
24 years.....	twenty-four (24) days
25 years or more of service.....	twenty-five (25) days
Plus 1 day per year for medical visit	

SICK LEAVE:

10 days after one year worked. Unused sick days to be paid in cash.

(Local #32 B/J)

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SECTION 01000

**GENERAL
CONDITIONS**

APPLICABLE TO ALL CONTRACTS

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The ADDENDUM TO THE GENERAL CONDITIONS is contained in Volume 3 of the Contract Documents. Volume 3 contains the following:

- Addendum to the General Conditions
- Specifications

SECTION 01000 GENERAL CONDITIONS

PART 1 - GENERAL

1.01 Applicability of General Conditions

- A. Since there are several separate Contracts pertaining to the construction of this project, for convenience, the General Conditions are stated only once. These General Conditions are applicable to all Contracts and shall constitute an integral part of each separate Contract to the same extent as though they were repeated in full therein.
- B. The Contractor is advised that various sections of these General Conditions are amended by the Addendum to the General Conditions. This Addendum also includes various schedules referred to in these General Conditions (Schedules A through F). These schedules contain important information that is specific to this project. The Addendum, including Schedules A through F, is set forth in Volume 3 of the Contract Documents.
- C. Throughout these General Conditions, various responsibilities and obligations are assigned to each of the following four Contractors: (1) General Construction, (2) Plumbing, (3) Heating/Ventilating/Air-Conditioning/Fire Protection, and (4) Electrical. In the event the Project does not involve all four Contracts, the responsibilities and obligations of each omitted Contract shall be assigned to one of the Contracts which is included in the Project. The Addendum to the General Conditions specifies which Contractor shall perform the responsibilities and obligations of each omitted contract, as set forth in the General Conditions.

1.02 Scope and Intent

- A. DESCRIPTION OF PROJECT - Refer to the Addendum to the General Conditions for a description of this project.
- B. PROGRESS SCHEDULE
 - 1. Within 15 days after the Notice to Proceed, the Contractor for General Construction Work shall prepare a composite Job Progress Chart that shall indicate graphically and chronologically the time the various parts of the work of all Contracts shall commence and be completed. The Chart shall be in a reproducible form approved by the Commissioner.
 - 2. Immediately after the Notice to Proceed of their Contracts, the Contractors for Plumbing Work, Heating, Ventilating and Air Conditioning Work (HVAC) and Electrical Work, as applicable, shall furnish all necessary data to the Contractor for General Construction Work, and cooperate in all respects in connection with formulation of the Chart.
 - 3. The Chart shall show the sequence and interrelationship of each operation of all the Contracts.
 - 4. The Chart shall show the estimated time for fabrication and/or delivery of all materials and equipment required for the work.
 - 5. As directed by the Resident Engineer, the Contractors shall meet with each other and with the Resident Engineer to review and make the necessary adjustments to the composite Job Progress Chart, and to coordinate the work indicated thereon. (Article 12 of the Contract).
 - 6. When completed, the Job Progress Chart shall be signed and dated by each Contractor or their official representative. The Resident Engineer is authorized to sign the Chart for the Department of Design and Construction. Thereafter, the Chart shall be modified only with the Commissioner's approval. When directed by the Commissioner, the Chart shall be revised and updated. If necessary, a new revised Chart shall be prepared in the same manner as outlined above for the original Chart.

7. The approved Chart shall be distributed by the Contractor for General Construction Work, as follows: the original and two (2) copies to the Resident Engineer, two (2) copies to each Contractor, and two (2) copies to the Department of Design and Construction
 8. All Contractors shall consult the approved Progress Chart and install their work within the time limits indicated on the Chart.
 9. The Resident Engineer shall post in a prominent place in the field office a copy of the Chart and mark thereon the progress of the work, including the times when various parts of the work commenced and were completed.
- C. **COMPLETION OF WORK** - Work to be done under each separate Contract comprises the furnishing of all labor, materials, equipment and other appurtenances and obtaining of all regulatory agency approvals necessary and required to complete the construction work in accordance with the Contract.
- D. **OMISSION OF DETAILS** - All work called for in the Specifications applicable to each separate Contract but not shown on the Contract Drawings in their present form, or vice versa, is required, and shall be performed by the Contractor as though it were originally delineated or described. Such work is deemed included in the Bid Price.
- E. **WORK NOT IN SPECIFICATIONS OR CONTRACT DRAWINGS** - Work not particularly specified in the Specifications nor detailed on the Contract Drawings but involved in carrying out their intent or in the complete and proper execution of the work, is required, and shall be performed by the Contractor. Such work is deemed included in the Bid Price.
- F. **SILENCE OF THE SPECIFICATIONS** - The apparent silence of the Specifications as to any detail, or the apparent omission from them of a detailed description concerning any work to be done and materials to be furnished, shall be regarded as meaning that only the best practice is to prevail and that only the best material and workmanship is to be used and interpretation of the Specifications shall be made upon that basis.
- G. **CONFLICT BETWEEN CONTRACT DRAWINGS AND SPECIFICATIONS** - Should any conflict occur in or between the Drawings and Specifications, the Contractor shall be deemed to have estimated on the most expensive way of doing the work unless the Contractor shall have asked for and obtained a decision in writing from the Commissioner before the submission of the bid as to what shall govern.
- H. **COOPERATION BETWEEN CONTRACTORS** - Inasmuch as the completion of the project within the prescribed limit of time is dependent largely upon the close and active cooperation of all those engaged therein, it is therefore expressly understood and agreed that the Contractor shall lay out and install all work at such time or times and in such manner as not to delay or interfere with the carrying forward of the work of other Contractors. In the event of any dispute arising as to possible or alleged interference between the various Contractors which may retard the progress of the work, the dispute shall be adjudicated by the Commissioner, whose decision as to the party or parties at fault and as to the manner in which the matter may be adjudicated, shall be binding and conclusive on all parties.
- I. **"DIRECTED," "REQUIRED," ETC.** - Wherever reference is made in the Contract to the work or its performance, the terms "directed," "required," "permitted," "ordered," "designated," "prescribed," "determined," and words of similar import shall, unless expressed otherwise, imply the direction, requirements, permission, order, designation or prescription of the Commissioner.
- J. **"APPROVED," ETC.** - "Approved," "acceptable," "satisfactory," and words of similar import shall mean and intend approved, acceptable or satisfactory to the Commissioner.
- K. **CONFLICTS OF INTERESTS** - The Charter of the City of New York, Section 2604, provides a number of safeguards in relation to conflicts of interest. Such safeguards include, without limitation, the following: "No public servant shall receive compensation except from the City for performing any official duty or accept or receive any gratuity from any person whose interest may be affected by the

public servant's official action."

1. Other sections of the City Charter, the Administrative Code and the Penal Law are applicable in implementing the basic Conflicts of Interest Section and under certain circumstances penalties may be invoked against the donor as well as the recipient of any form of valuable gift.
2. Notice is hereby given that sections of the City Charter, the Administrative Code and the Penal Law alluded to herein shall apply under the terms of this Contract to circumstances relevant to conflicts of interest and shall be extended in application to subcontractors authorized to perform work, labor and services pursuant to this Contract and further, it shall be the duty and responsibility of the Contractors to so inform their respective subcontractors.

1.03 Provisions Referenced in the Contract

- A. Various Articles of the Contract refer to requirements set forth in Schedule A of the General Conditions. Schedule A, which is included in the Addendum to the General Conditions, sets forth 1) the referenced Articles of the Contract, and 2) the specific requirements applicable to each respective Contract.
- B. Applications for Extensions of Time, as indicated in Article 13 of the Contract, shall be made in accordance with the Rules of the Procurement Policy Board.
- C. **PARTIAL PAYMENTS FOR MATERIALS IN ADVANCE OF THEIR INCORPORATION IN THE WORK PURSUANT TO ARTICLE 42 OF THE "CONTRACT"** - In order to better insure the availability of materials, fixtures and equipment when needed for the work, the Commissioner may authorize partial payment for certain materials, fixtures and equipment, prior to their incorporation in the work, but only in strict accordance with, and subject to, all the terms and conditions set forth in the Specifications, unless an alternate method of payment is elsewhere provided in the Specifications for specified materials, fixtures or equipment.
 1. The Contractor shall submit to the Commissioner a written request, in quadruplicate, for payment for materials purchased or to be purchased for which the Contractor needs to be paid prior to their actual incorporation in the work. The request shall be accompanied by a schedule of the types and quantities of materials, and shall state whether such materials are to be stored on or off the site.
 2. Where the materials are to be stored off the site, they shall be stored at a place other than the Contractor's premises (except with the written consent of the Commissioner) and under the conditions prescribed or approved by the Commissioner. The Contractor shall set apart and separately store at the place or places of storage all materials and shall clearly mark same "PROPERTY OF THE CITY OF NEW YORK", and further, shall not at any time move any of said materials to another off-site place of storage without the prior written consent of the Commissioner. Materials may be removed from their place of storage off the site for incorporation in the work upon approval of the Resident Engineer.
 3. Where the materials are to be stored at the site, they shall be stored at such locations as shall be designated by the Resident Engineer and only in such quantities as, in the opinion of the Resident Engineer, will not interfere with the proper performance of the work by the Contractor or by other Contractors then engaged in performing work on the site. Such materials shall not be removed from their place of storage on the site except for incorporation in the work, without the approval of the Resident Engineer.
4. **INSURANCE**
 - a. **STORAGE OFF-SITE** - Where the materials are stored off the site and until such time as they are incorporated in the work, the Contractor shall fully insure such materials against any and all risks of destruction, damage or loss including but not limited to fire, theft, and any other casualty or happening. The policy of insurance shall be payable to the City of New York. It shall be in such terms and amounts as shall be approved by the Commissioner and shall be

placed with a company duly licensed to do business in the State of New York. The Contractor shall deliver the original and one (1) copy of such policy or policies marked "Fully Paid" to the Commissioner.

- b. **STORAGE ON THE SITE** - Where the materials are stored at the site, the Contractor shall furnish satisfactory evidence to the Commissioner that they are properly insured against loss, by endorsements or otherwise, under the policy or policies of insurance obtained by the Contractor to cover losses to materials owned or installed by the Contractor. The policy of insurance shall cover fire and extended coverage against windstorm, hail, explosion and riot attending a strike, civil commotion, aircraft, vehicles and smoke.
5. All costs, charges and expenses arising out of the storage of such materials, shall be paid by the Contractor and the City hereby reserves the right to retain out of any partial or final payment made under the Contract an amount sufficient to cover such costs, charges and expenses with the understanding that the City shall have and may exercise any and all other remedies at law for the recovery of such cost, charges and expenses. There shall be no increase in the Contract price for such costs, charges and expenses and the Contractor shall not make any claim or demand for compensation therefor.
6. The Contractor shall pay any and all costs of handling and delivery of materials, to the place of storage and from the place of storage to the site of the work; and the City shall have the right to retain from any partial or final payment an amount sufficient to cover the cost of such handling and delivery.
7. In the event that the whole or any part of these materials are lost, damaged or destroyed in advance of their satisfactory incorporation in the work, the Contractor, at the Contractor's own cost, shall replace such lost, damaged or destroyed materials of the same character and quality. The City will reimburse the Contractor for the cost of the replaced materials to the extent, and only to the extent, of the funds actually received by the City under the policies of insurance hereinbefore referred to. Until such time as the materials are replaced, the City will deduct from the value of the stored materials or from any other money due under the Contract, the amount paid to the Contractor for such lost, damaged or destroyed materials.
8. Should any of the materials paid for the City hereunder be subsequently rejected or incorporated in the work in a manner or by a method not in accordance with the Contract and Specifications, the Contractor shall remove and replace, at Contractor's own cost, such defective or improperly incorporated material with materials complying with the Contract and Specifications. Until such materials are replaced, the City will deduct from the value of the stored materials or from any other money due the Contractor, the amount paid by the City for such rejected or improperly incorporated materials.
9. Payments for the cost of materials made hereunder shall not be deemed to be an acceptance of such materials as being in accordance with the Contract Documents, and the Contractor always retains and must comply with the Contractor's duty to deliver to the site and properly incorporate in the work only materials which comply with the Contract Documents.
10. The Contractor shall retain any and all risks in connection with the damage, destruction or loss of the materials paid for hereunder to the time of delivery of the same to the site of the work and their proper incorporation in the work in accordance with the Contract Documents.
11. The Contractor shall comply with all laws and the regulations of any governmental body or agency pertaining to the priority purchase, allocation and use of the materials.
12. When requesting payment for such materials, the Contractor shall submit with the partial estimate duly authenticated documents of title, such as bills of sale, invoices or warehouse receipts, all in quadruplicate. The executed bills of sale shall transfer title to the materials from the Contractor to the City (in the event that the invoices state that the material has been purchased by a subcontractor, bills of sale in quadruplicate will also be required transferring title to the materials

from subcontractor to the Contractor).

13. Where the Contractor, with the approval of the Commissioner, has purchased unusually large quantities of materials in order to assure their availability for the work, the Commissioner, at the Commissioner's option, may waive the requirements of Paragraph 12 provided the Contractor furnishes evidence in the form of an affidavit from the Contractor in quadruplicate, and such other proof as the Commissioner may require, that the Contractor is the sole owner of such materials and has purchased them free and clear of all liens and other encumbrances. In such event, the Contractor shall pay for such materials and submit proof thereof, in the same manner as provided in Paragraph 12 hereof, within seven (7) days after receipt of payment therefor from the Comptroller. Failure on the part of the Contractor to submit satisfactory evidence that all such materials have been paid for in full, shall preclude the Contractor from payments under the Contract.
14. The Contractor shall include in each succeeding partial estimate requisition a summary of materials stored which shall set forth the quantity and value of materials in storage, on or off the site, at the end of each preceding estimate period; the amount removed for incorporation in the work; the quantity and value of materials delivered during the current period and the total value of materials on hand for which payment thereof will be included in the current payment estimate.
15. Upon proof to the satisfaction of the Commissioner of the actual cost of such materials and upon submission of proper proof of title as required under Paragraph 12 or Paragraph 13 hereof, payment will be made therefore to the extent of 85%, provided however, that the cost so verified, established and approved shall not exceed the estimated cost of such materials included in the approved detailed breakdown estimate submitted in accordance with Article 41 of the Contract; if it does, the City will pay only 85% approved estimated cost.
16. Upon the incorporation in the work of any such materials, which have been paid for in advance of such incorporation in accordance with the foregoing provisions, payment will be made for such materials incorporated in the work pursuant to Article 42 of the Contract, less any sums paid pursuant to Paragraph 15 herein.

D. **EXCISE AND TRANSPORTATION TAXES-** Pursuant to Section 6 of the "Information for Bidders", the Contractor may be exempted from the payment of Federal Excise and Transportation Taxes in accord with the following:

1. Excise Tax Exemption Certificate will be certified by the Department of Design and Construction where requested by the Contractor, for items which fall within the scope of the Contract and which may be exempt from Federal Excise Tax.
2. **TRANSPORTATION TAX** - The 3% Federal Tax has been repealed and is hereby deleted from the Contract. The 10% Federal Tax for travel remains in effect.

E. **CORRESPONDENCE** - There shall be six (6) copies of all letters of correspondence to the Department of Design and Construction. An additional copy of all correspondence shall be sent directly to the Resident Engineer at the job site.

F. **MOBILIZATION PAYMENT** - A line item for mobilization shall be allowed on the Contractor's Detailed Estimate Breakdown submitted in accordance with Article 41 of the Contract. The Mobilization Payment is intended to include the cost of required bonds, insurance coverage and/or any other expenses required for the initiation of the Contract Work. All costs for mobilization shall be deemed included in the total Contract Price. The Detailed Estimate shall reflect, and the Mobilization Payment shall be made, in accordance with the following schedule:

Contract Amount	Percent	Mobilization
Less than \$ 50,000 x	0 =	0
\$ 50,000 - \$ 100,000	= \$	6,000
\$ 100,001 - \$ 500,000 x	6 = \$	6,000 (min) - \$ 30,000 (max)

\$ 500,001 - \$ 2,500,000 x 5 = \$ 30,000 (min) - \$ 125,000 (max)
Over \$ 2,500,000 x 4 = \$ 125,000 (min) - \$ 300,000 (max)

The Contractor may requisition for one-half (1/2) of the Mobilization Payment upon satisfactory completion of the following:

1. Installation of any required field office(s).
2. Submission of all required insurance certificates and bonds.
3. Approval by the Department of Design and Construction of the coordinated progress schedule for the project and the Contractor's Shop Drawing schedule.

The remaining balance of the Mobilization Payment may be requisitioned only after 10 percent (10%) of the Contract price, exclusive of the total amount of Mobilization Payments made or to be made hereunder, shall have been approved for payment.

1.04 Contract Drawings

- A. **SCHEDULE C** - The Contract Drawings are listed in Schedule C, which is set forth in the Addendum to the General Conditions. Such drawings referred to in the Contract, and in the applicable Specifications for the various Contracts bear the general title:

City of New York
Department of Design and Construction
Division of Structures

- B. **DOCUMENTS FURNISHED TO THE CONTRACTOR** - After the award of the Contract, the Contractor for General Construction Work will be furnished with five (5) sets of paper prints of all Contract Drawings mentioned in Paragraph A above.
- C. **PRINTS (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

Each Contractor, other than the Contractor for General Construction Work referred to in Paragraph B, will receive two (2) sets of paper prints of all Drawings listed in Paragraph A and three (3) sets of paper prints of all Contract Drawings applying directly to each Contractor's own Contract.

- D. Each Contractor will receive nine (9) complete sets of Specifications.
- E. **ADDITIONAL COPIES** of Drawings and Specifications, when requested, will be furnished to the Contractor if available.
- F. **COORDINATION AND COOPERATION** - Since the Contracts are all related to the project, the Contractor shall consult and study the requirement of the Contract Drawings and Specifications of all Contracts furnished to the Contractor, so that the Contractor may become acquainted with the work of the project as a whole in order to achieve the proper coordination and cooperation necessary for the efficient and timely performance of the work.
- G. **SUPPLEMENTARY DRAWINGS** - When, in the opinion of the Commissioner, it becomes necessary to more fully explain the work to be done, or to illustrate the work further, or to show any changes which may be required, drawings known as Supplementary Drawings will be prepared by the Commissioner.
- H. **COMPENSATION** - Where Supplementary Drawings entail extra work, compensation therefor to the Contractor shall be subject to the terms of the "Contract". The Supplementary Drawings shall be binding upon the Contractor with the same force as the Contract Drawings.

- I. SUPPLEMENTARY DRAWING PRINTS - Three (3) copies of prints of these Supplementary Drawings will be furnished to the Contractor.
- J. COPIES TO SUBCONTRACTORS - The Contractor shall furnish each of its subcontractors and material suppliers such copies of Contract Drawings, Supplementary Drawings, or copies of the Specifications as may be required for its work.
- K. CONTRACTOR TO CHECK DRAWINGS - The Contractor shall verify all dimensions, quantities and details shown on the Contract Drawings, Schedules, or other data received from the Commissioner, and shall notify the Commissioner of all errors, omissions, conflicts and discrepancies found therein. Notice of such errors shall be given before the Contractor proceeds with any work. Figures shall be used in preference to scale dimensions and large-scale drawings in preference to small-scale drawings.

1.05 Shop Drawings and Record Drawings

A. SHOP DRAWINGS

- 1. SUBMISSION OF SHOP DRAWINGS - For instructions relative to Shop Drawings involving electrical or mechanical work or equipment of any nature called for in any Contract, see the General Electrical Requirements and the General Mechanical Requirements.
- 2. SHOP DRAWINGS - The Contractor shall promptly prepare and submit layout detail and Shop Drawings of such parts of the work as are indicated in the Specifications or as required. These Shop Drawings shall be made in accordance with the Contract Drawings, Specifications and Supplementary Drawings, if any. The Shop Drawings shall be accurate and distinct and give all the dimensions required for the fabrication, erection and installation of the work.
- 3. SIZE OF DRAWINGS - The Shop Drawings, unless otherwise directed, shall preferably be on sheets of the same size as the Contract Drawings, with a one half (1/2) inch marginal space on each side and a two (2) inch marginal space for binding on the left side.
- 4. SCOPE OF DRAWINGS - Shop Drawings shall be numbered consecutively and shall accurately and distinctly represent the following:
 - a. All working and erection dimensions.
 - b. Arrangements and sectional views.
 - c. Necessary details, including performance characteristics, and complete information for making necessary connections with other work.
 - d. Kinds of materials including thicknesses and finishes.
 - e. All other information required by the Commissioner.
- 5. TITLES AND REFERENCE - Shop Drawings shall be dated and contain:
 - a. Name of the Project, DDC Project Number and Contract Number.
 - b. The descriptive names of equipment, or materials covered by the Contract Drawings and the classified item number or numbers, if any, under which it is, or they are required.
 - c. The locations or points at which materials, or equipment, are to be installed in the work.
 - d. Cross references to the section number, detail number and paragraph number of the Contract Specifications.

- e. Cross references to the sheet number, detail number, etc., of the Contract Drawings.

NOTE: In addition to the above requirements, the Shop Drawings shall bear a stamp having the following wording:

FIELD MEASUREMENTS - The Contractor certifies that it has verified and supplemented the Contract Drawings by taking all required field measurements, that said measurements correctly reflect all field conditions and that this Shop Drawing incorporates said measurements.

6. THE SUBMISSION OF SHOP DRAWINGS - The Shop Drawings shall be accompanied by a letter of transmittal, in triplicate, containing the name of the Project, the name of the Contractor, the number of Drawings, titles and any other requirements. Re-submission of the same drawings shall bear the original number of the drawings and the original titles.
7. PRELIMINARY SUBMISSION - The Contractor shall submit one (1) set of sepia Shop Drawings to the Consultant Architect/Engineer for their approval. A satisfactory Shop Drawing will be stamped "Approved", be dated and one (1) copy thereof will be returned to the Contractor by letter. Should the Shop Drawing not be approved by the Consultant Architect/Engineer, the Commissioner will return the sepia Shop Drawings with the necessary corrections and changes to be made as indicated thereon.
8. REVISIONS - The Contractor must make such corrections and changes and again submit one (1) set of sepia drawings for the approval of the Consultant Architect/Engineer. The Contractor shall revise and resubmit the Shop Drawing as required by the Consultant Architect/Engineer until approval thereof is obtained. However, Shop Drawings which have been stamped "Approved As Noted" shall be considered an "Approved" Shop Drawing and NEED NOT be revised and resubmitted.

No work called for by the Shop Drawings shall be done until the approval of the said drawings by the Consultant Architect/Engineer is given. In addition to the foregoing Shop Drawing transmissions, a copy of any Shop Drawing prepared by any of the Contractors which Shop Drawing indicated work related to, adjacent to, impinging upon, or affecting work to be done by other Contractors, shall be transmitted to the Contractors so affected. These approved Shop Drawings shall be delivered to the Resident Engineer for distribution to the affected Contractors at the job meetings and shall be so recorded in the minutes.

9. FINAL SUBMISSION - When approval of any Shop Drawing is obtained by the Contractor, it shall insert the date of the approval of the drawing and promptly furnish the Consultant Architect/Engineer with eight (8) additional prints of the approved Drawings. No work called for by the Shop Drawings shall be performed until the approval of the said drawings by the Commissioner is given. In addition to the foregoing Shop Drawing transmissions, a copy of any Shop Drawing prepared by any of the Contractors which indicates work related to, adjacent to, impinging upon, or affecting work to be done by other Contractors, shall be transmitted to the Contractors so affected. These approved Shop Drawings shall be delivered to the Resident Engineer for distribution to the affected Contractors at the job meetings and shall be so recorded in the minutes.
10. VARIATIONS - If the Shop Drawings show variations from the Contract requirements because of standard shop practice or other reasons, the Contractor shall make specific mention of such variations in its letter of submittal. Approval of the Shop Drawings shall constitute approval of the subject matter thereof only and not of any structural apparatus shown or indicated.
11. CATALOGUE CUTS - Except as otherwise prescribed herein, the submission of catalogue cuts shall conform to the procedures specified for Shop Drawings.
- a. PRELIMINARY SUBMISSION - The Contractor shall submit three (3) sets of catalogue cuts to the Consultant Architect/Engineer to approve. A satisfactory catalogue cut will be stamped

"Approved", be dated and one (1) copy thereof will be returned to the Contractor by letter. Should the catalogue cut not be approved by the Commissioner, the Commissioner will return one (1) set of such catalogue cuts with the necessary corrections and changes to be made indicated thereon.

- b. REVISIONS - The Contractor shall make such corrections and changes and again submit four (4) sets of the catalogue cuts, in duplicate, for the approval of the Commissioner. The Contractor shall revise and resubmit the catalogue cuts as required by the Consultant Architect/Engineer until approval thereof is obtained.

However, catalogue cuts which have been stamped "Approved As Noted" shall be considered an "Approved" catalogue cut and need not be revised and resubmitted.

- c. FINAL SUBMISSION - When approval of any catalogue cut is obtained by the Contractor, it shall insert the date of the approval and promptly furnish the Consultant Architect/Engineer with four (4) additional sets of the approved catalogue cuts.

12. RESPONSIBILITY OF CONTRACTOR - The approval of Shop Drawings will be general and shall not relieve the Contractor of responsibility for the accuracy of such Shop Drawings, nor for the proper fitting and construction of the work, nor of the furnishing of materials or work required by the Contract and not indicated on the Shop Drawings. Approval of Shop Drawings shall not be construed as approving departures from the Contract Drawings, Supplementary Drawings or Specifications.

13. SHOP DRAWINGS AND MATERIAL SAMPLES SCHEDULE - The Shop Drawings and Material Samples Schedule is set forth in Schedule F, which is included in the Addendum to the General Conditions. Completion of this Schedule shall be in accordance with Article 1.41 (A) of these General Conditions.

14. PROCEDURE FOR PREPARING, FORWARDING, CHECKING AND RETURN - of all Shop Drawings shall be, generally, as follows:

The Contractor shall make available to its subcontractors the necessary Contract Documents and have them determine dimensions and conditions in the field, particularly with reference to coordination with other trades or work under other Contractors. The Contractor shall direct its subcontractors to prepare Shop Drawings for submission to the Consultant Architect/Engineer in accordance with the requirements of these General Conditions. The Contractor shall also direct its subcontractors to "Ring Up" corrections made on all re-submissions for approval, so as to be readily seen, and that the symbol "sub" be used to identify the source of the correction or information that has been added.

The Contractor shall:

- a. Review and be responsible to the Commissioner, or the Commissioner's authorized representative, for information shown on subcontractor's Shop and Installation drawings and manufacturers' date, and also for conformity to Contract Documents.
- b. "Ring Up" corrections made on all submissions for approval, so as to be readily seen, and that the symbol "GC", "PL", "HVAC" or "EL" be used to indicate that the correction and/or information added was made by the Contractor.
- c. Clearly designate which trade is to perform the work when the term, "work by others" or other similar phrases are indicated on the Contract Drawings before submission to the Consultant Architect/Engineer.
- d. Stamp submissions "Recommended for Approval", date and forward to the Commissioner or the Commissioner's authorized representative.

In order to expedite Shop Drawing procedures, the Contractor shall write a Shop Drawing status letter directly to the Consultant Architect/Engineer, each week, containing the following subject matter:

- (1) A list of all Shop Drawings which have been sent to but not returned by the Architect or Engineer giving name of the subcontractor, drawing number, title and date of submission.
- (2) An indication of the desired priority of the return, if necessary.

NOTE: The status letter shall be prepared and sent at a given time each week, preferably Friday afternoon, to enable the Consultant Architect/Engineer to receive the letter on Monday morning. This procedure shall be maintained throughout the active Shop Drawing period of construction.

B. INTEGRATED DRAWINGS (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

1. The Contractor for General Construction Work shall provide to the Contractor for Heating, Ventilating and Air Conditioning Work reflected ceiling starting points or plans, beam soffit elevations, ceiling heights, roof openings, etc.
2. The Contractor for Heating, Ventilating and Air Conditioning Work shall prepare a drawing or drawings showing ductwork, heating and sprinkler piping. This drawing shall include location of grilles, registers, etc. and access doors in hung ceilings. Locations shall be fixed by elevations and dimensions from column center lines and/or walls.
3. The Contractor for Heating, Ventilating and Air Conditioning Work shall prepare and distribute to each of the other Contractors, the Resident Engineer and to the Consultant Architect a sepia of the above.
4. The Contractor for General Construction Work shall lay out on its sepia, the reflected ceiling plan, beam soffit elevations, ceiling heights, roof openings, etc.
5. The Contractor for Plumbing Work shall lay out its piping, valves, cleanouts, etc., indicating locations and elevations and shall indicate the necessary access doors.
6. The Contractor for Electrical Work shall indicate its fixtures, large conduit runs, clearances, pull boxes, junction boxes, sound system speakers, etc.
7. The Resident Engineer will call as many meetings with the Contractors as are necessary to resolve any conflicts that become apparent. The Resident Engineer will call on the services of the Consultant Engineer or Architect where necessary. The Resident Engineer is responsible for the coordination of the Contract Drawings.
8. Upon resolution of the conflicts, each Contractor shall enter its own work on the Resident Engineer's sepia, which will become the Master or Integrated Drawing. The Master Sepia shall be signed by each Contractor to indicate its acceptance of the arrangement of the work.
9. A reproducible copy of the Master Integrated Drawing or Drawings will be prepared and distributed by the Contractor for Heating, Ventilating and Air Conditioning Work to each Contractor and to the Consultant Architect for information.
10. Each Contractor shall prepare its Shop Drawings in accordance with the Integrated Drawings. No work will be permitted without approved Shop Drawings. It is therefore essential that this procedure be instituted as quickly as possible.
11. Contractors shall be held strictly accountable for cooperation in preparing the Integrated Drawing or Drawings.

C. RECORD DRAWINGS

1. The Department of Design and Construction, at the start of construction (kick-off meeting), will furnish to each Contractor at no cost a complete set of Contract Document mylars pertaining to the work to be performed under its Contract. It is the responsibility of each Contractor to modify the Contract Drawings to indicate all changes and corrections, if any, occurring in the work as actually installed. The Contractor is required to furnish all other mylar drawings if necessary such as Addenda Drawings and Supplementary Drawings as may be necessary to indicate all work in detail as actually completed.

NOTE TO CONTRACTOR: All professional seals must be blocked out. Title box complete with project title and Consultants' names will remain.

2. Each Contractor shall maintain, during the progress of the work, an accurate record of the work as actually installed, on Record Drawings, on mylar, in ink. These Record Drawings shall be made available to the Resident Engineer upon request.

The Contractor's attention is particularly directed to the necessity of keeping accurate records of all subsurface and concealed work, so that the Record Drawings may contain this information in exact detail and location. Record Drawings should also show all connections, valves, gates, switches, cut-outs and similar operating equipment.

Before substantial completion payment, each Contractor shall furnish to the Commissioner one (1) complete set of mylar Record Drawings, in ink indicating all of the work and locations as actually installed, plus one (1) set of paper prints which will be furnished to sponsoring agency by Department of Design and Construction.

3. Record Drawings shall be of the same size as that of the Contract Drawings, with a one (1) inch margin on three (3) sides and a two (2) inch margin on the left side.
4. Each Record Drawing shall bear the legend "RECORD DRAWING" in heavy block lettering, one half (1/2) inch high, and contain the following data:

RECORD DRAWING

Contractor's Name _____

Contractor's Address _____

Made by _____ Date _____

Checked by _____ Date _____

Commissioner's Representatives

(Resident Engineer)	DDC
(Plumbing Inspector)	DDC
(Heating & Ventilating Inspector)	DDC
(Electrical Inspector)	DDC

5. RECORD DRAWING TITLE SHEET - Each Contractor shall prepare a title sheet, the same size as Record Drawings, which shall contain the following:

a. Heading:

The City of New York
Department of Design and Construction
Division of Structures

b. Capital Budget Project Number (CAPIS ID)

- c. Name and Location of Project
 - d. Contractor's Name and Address
 - e. Record of changes (a caption description of work affected, and the date and number of Change Order or other authorization)
 - f. List of Record Drawings
6. All changes from Contract Drawings shall be distinctly encircled and identified by Change Order number correlating to changes listed on the "Title Sheet." The Contractor shall show within the encircled areas the work as actually installed.
7. **BULLETINS, OPERATING AND SERVICE MANUALS** - Where the Contractor has submitted prints in the form of technical bulletins, operating and service manuals, or other printed matter as a Shop Drawing, having diagrams or drawings thereon of a material or equipment installed in the work, the Contractor shall furnish three (3) sets thereof so that the Commissioner may have all the necessary information for the proper operation maintenance and repair of the material and equipment and the ordering of spare parts. All bulletins and operating and service manuals shall be compiled and indexed in book form for each Contract.

1.06 Approval of Materials

- A. **LOCAL LAWS** - All materials, appliances and types or methods of construction shall be in accordance with the Specifications and shall in no event be less than that necessary to conform to the requirements of the Building Code of the City of New York, Administrative Code and Charter of the City of New York.
- B. **APPROVAL OF MANUFACTURER** - The names of proposed manufacturers, material suppliers, and dealers who are to furnish materials, fixtures, equipment, appliances or other fittings shall be submitted to the Commissioner for approval, as early as possible, to afford proper review and analysis.
- C. **REPUTE OF MANUFACTURER** - No manufacturer will be approved for any materials to be furnished under the Contract unless it shall be of good reputation, shall have a plant of ample capacity and shall have successfully produced similar products. All required approvals for legal use of materials and equipment such as B.S.A. and M.E.A. must be obtained prior to installation.
- D. **ALL MATERIALS** - fixtures, fittings, supplies and equipment furnished under the Contract shall be new and unused, except as approved by the Agency, and of standard first-grade quality and of the best workmanship and design. The City of New York encourages the use of recycled products where practical.
- E. **INFORMATION TO SUPPLIERS** - In asking for prices on materials under any item of the Contract, the Contractor shall provide the manufacturer or dealer with such complete information from the Specifications and Contract Drawings as may in any case be necessary, and in every case the Contractor shall inform the manufacturer or dealer of all the General Conditions and requirements herein contained.
- F. **STANDARD REFERENCES** - Whenever reference is made to the furnishing of materials or testing thereof to conform to the standards of any technical society, organization or body, it shall be construed to mean the latest standard, code, specification or tentative specification adopted and published at the date of advertisement for bids, even though reference has been made to an earlier standard.
- G. **REFERENCES** - Reference to a technical society, organization or body may be made in the Specifications by abbreviations in accordance with the following list:

A.I.A. for American Institute of Architects

A.C.I.	for American Concrete Institute
A.G.A.	for American Gas Association
A.G.M.A.	for American Gear Manufacturer Association
A.I.E.E.	for American Institute of Electrical Engineers
A.I.S.C.	for American Institute of Steel Construction
A.S.A.	for American Standards Association
A.S.T.M.	for American Society for Testing Materials
A.W.S.C.	for American Welding Society Code
A.W.W.A.	for American Water Works Association
B.S. & A.	for New York City Board of Standards & Appeals
C.I.P.R.A.	for Cast Iron Pipe Research Association
B.G. & E.	for Bureau of Gas & Electricity of the City of New York
FED. SPEC.	for Federal Specification
I.P.C.E.A.	for Insulated Power Cable Engineer's Association
NAVY SPEC.	for Navy Department Specification
N.E.C.	for National Electric Code
N.E.M.A.	for National Electrical Manufacturers Association
N.Y.B.C.	for New York City Building Code
N.Y.E.C.	for New York City Electrical Code
N.Y. SPEC.	for New York City Department of Purchase Specification
P.P.S.	for Power Piping Society
S.A.E.	for Society of Automotive Engineers Standards
S.H.B.I.	for Steel Heating Boiler Institute

H. STANDARD SPECIFICATIONS - When no reference is made to a code, standard or specification, the Standard Specifications of the ASTM or the AIEE, as the case may be, shall govern.

I. SAMPLES OF MATERIALS - The Contractor shall submit to the Commissioner for approval, samples of all materials specified to be used in the project.

1. For samples of materials involving electrical work of any nature, see the General Electrical Requirements.
2. Samples shall be in triplicate, of sufficient size to show the quality, type, range of color, finish and texture of the material. However, in addition thereto, after approval, three (3) additional samples showing the material, color and texture of all interior finishes, including the finishes of exposed built-in equipment, trim, glazing, fittings and fixtures, etc., shall also be furnished. The sizes of these additional samples shall be as directed by and acceptable to the Commissioner.
3. Each of the samples shall be labeled, bearing the name and quality of the material, the Contractor's name, date, Contract and project, and the related Specification or Contract Drawing reference to the samples submitted.
4. A letter of transmittal, in triplicate, from the Contractor requesting approval must accompany all such samples.
5. Transportation charges to the Commissioner's office must be prepared on all samples forwarded.
6. Samples for testing purposes shall be as required in the Specifications.

J. SAMPLES ON DISPLAY - When samples are specified to be equal to samples in the office of the Commissioner, they shall be carefully examined by the bidders and by those whom the bidder expects to employ for the furnishing of such materials.

K. TIMELY SUBMISSIONS LOG/SCHEDULE - Samples shall be submitted in accordance with approved Shop Drawing log so as to permit proper consideration without delaying any operation under the project. Materials should not be ordered until approval is received, in writing, from the Commissioner. All materials shall be furnished equal in every respect to the approved samples.

- L. **THE APPROVAL OF ANY SAMPLES** - will be given as promptly as possible, and shall be only for the characteristic color, texture, strength, or other feature of the material named in such approval, and no other. When this approval is issued by the Commissioner, it is done with the distinct understanding that the materials to be furnished will fully and completely comply with the Specifications, the determination of which may be made at some later date by a laboratory test or by other procedure. Use of materials will be permitted only so long as the quality remains equal to the approved samples and complies in every respect with the Specifications, and the colors and textures of the samples on file in the Office of the Commissioner, for the project.
- M. **ACCEPTIBILITY OF TEST DATA** - The Commissioner will be the final judge as to acceptability of laboratory test data and performance in service of materials submitted.
- N. **VALUABLE SAMPLES** - such as hardware, plumbing and electrical fixtures, etc., not destroyed by inspection or test, will be returned to the Contractor and may be incorporated into the work after all questions of acceptability have been settled, providing suitable permanent records are made as to the location of the samples, their properties, etc.
- O. **EQUIVALENT QUALITY OF MATERIALS** - All materials and equipment which are designated in the Specifications by a number in the catalogue of any manufacturer or by a manufacturer's grade or trade name, are designated for the purpose of describing the article and fixing the standard or the quality and finish. Materials and equipment, which are, in the opinion of the Commissioner, the equivalent to that specified, will be acceptable.
- P. The submission of any material, or article, as the equal of the materials or articles set forth in the Specifications as a standard shall be accompanied by illustrations, drawings, descriptions, catalogues, records of tests, samples and any and all other information essential for judging the equality to the materials, finish and durability of that specified as standard, as well as information indicating satisfactory use under similar operating conditions.
- Q. **MANUFACTURER'S DIRECTIONS** - Where the Specifications provide that the manufacturer's directions are to be used, such printed directions shall be submitted to the Commissioner.
- R. **COMMISSIONER TO SELECT INSPECTORS** - Except as specifically provided in the Specifications, the Commissioner will select and designate all persons, firms, or corporations to make or witness each and every inspection, test or analyses, with or without reports.
- S. **NOTICE** - The Contractor shall give notice in writing to the Commissioner sufficiently in advance of its intention to commence the manufacture or preparation of materials especially manufactured or prepared for use in or as part of the permanent construction. Such notice shall contain a request for inspection, the date of commencement and the expected date of completion of the manufacture or preparation of materials. Upon receipt of such notice, the Commissioner will arrange to have a representative present at such times during the manufacture as may be necessary to inspect the materials, or the Commissioner will notify the Contractor that the inspection will be made at a point other than the point of manufacture, or the Commissioner will notify the Contractor that inspection will be waived.
- T. **NO SHIPPING BEFORE INSPECTION** - The Contractor shall comply with the foregoing before shipping any material.
- U. **CERTIFICATE OF MANUFACTURE** - When the Commissioner so requires, the Contractor shall furnish to the Commissioner authoritative evidence in the form of Certificates of Manufacture that the materials to be used in the work have been manufactured and tested in conformity with the Specifications. These certificates shall include copies of the results of physical tests and chemical analyses where necessary, that have been made directly on the product, or on similar products being fabricated by the manufacturer. This may include such approvals as B.S.A., M.E.A., B.E.C. Advisory Board, etc.

- V. **ACCEPTANCE** - When materials or manufactured products shall comprise such quantity that it is not practical to make physical tests or chemical analyses directly on the product furnished, a certificate stating the results of such tests or analyses of similar materials which were concurrently produced may, at the discretion of the Commissioner, be considered as the basis for the acceptance of such material or manufactured product.
- W. **TESTING COMPLIANCE** - The testing personnel shall make the necessary inspections and tests, and the reports thereof shall be in such form as will facilitate checking to determine compliance with the Specifications, indicating thereon all analyses and/or test data and interpreted results thereof.
- X. **REPORTS** - Six (6) copies of the reports shall be submitted and authoritative certification thereof must be furnished to the Commissioner as prerequisite for the acceptance of any material or equipment.
- Y. **REJECTIONS** - If, in making any test, it is ascertained by the Commissioner that the material or equipment does not comply with the Specifications, the Contractor will be notified thereof, and will be directed to refrain from delivering said materials or equipment, or to promptly remove it from the site or from the work and replace it with acceptable material without cost to the City.
- Z. **FURNISH DESIGNATED MATERIAL** - Upon rejection of any material or equipment submitted as the equivalent of that specifically named in the Specifications, the Contractor shall immediately proceed to furnish the designated material or equipment.
- AA. **COST OF TESTS BORNE BY CITY** - Where the City directs test to be performed to determine compliance with the Specifications regarding materials or equipment, and where such compliance is ascertained as a result thereof, the City will bear the cost of such tests.
- BB. **COST OF TESTS BORNE BY CONTRACTOR** - Where tests are specifically called for in the Specifications to be made by the Contractor, the cost thereof shall be borne by the Contractor and shall be deemed to be included in the Contract price. The expenses of the testing personnel assigned by the City shall not be the Contractor's obligation. The Contractor shall reimburse the City for expenditures incurred in the making of tests on materials and equipment submitted by the Contractor as the equivalent of that specifically named in the Specifications and rejected for non-compliance.

1.07 Delivery of Materials

- A. **MATERIAL ORDERS** - The Contractor shall furnish to the Commissioner a copy of each material order, indicating date of order and quantity of material, and shall also notify the Commissioner when materials have been delivered to the site and in what quantities.
- B. **AMPLE QUANTITIES** - The Contractor shall deliver materials in ample quantities to insure the most prompt and uninterrupted progress of the work so as to complete the work within the Contract time.
- C. **CONTAINERS** - The manufacturer's containers shall be delivered with unbroken seals and shall bear proper labels.
- D. **THE CONTRACTOR SHALL COORDINATE DELIVERIES** - in order to avoid delaying or impeding the progress of the work of any related Contractor.
- E. **STACKING** - All materials shall be properly stacked in convenient places adjacent to the site, or where directed, and protected in a satisfactory manner. Stacked materials shall be so arranged as to not interfere with visibility of traffic control devices.
- F. **OVERLOADING** - If authority is given to store materials in any part of the project area, they shall be so stored as to cause no overloading.
- G. **NO INTERFERENCE** - If it becomes necessary to remove and restack materials to avoid impeding the progress of any part of the work or interfering with the work to be done by any other Contractor, the relevant Contractor shall remove and restack such materials at no additional cost to the City.

1.08 Temporary Structures

- A. **FIELD OFFICE FOR CONTRACTOR** - The Contractor shall establish a temporary field office for its own use at the site during the period of construction, at which readily accessible copies of all Contract Documents shall be kept.
- B. The field office shall be located where it will not interfere with the progress of any part of the work or with visibility of traffic control devices.
- C. **CONTRACTOR'S REPRESENTATIVE** - In charge of each office there shall be a responsible and competent representative of the Contractor, duly authorized to receive orders and directions and to put them into effect.
- D. **TELEPHONE ARRANGEMENTS** - Arrangements shall be made by the Contractor whereby its representative may be readily accessible by telephone.
- E. **MATERIAL SHEDS** - used by the Contractor for the storage of its materials shall be kept at locations which will not interfere at any time with the progress of any part of the work or with visibility of traffic control devices.
- F. **SUBSTANTIAL CONSTRUCTION** - All temporary structures shall be of substantial construction and neat appearance, and shall be painted a uniform gray unless otherwise directed by the Commissioner.
- G. **ADVERTISING PRIVILEGES** - The City reserves the right to all advertising privileges. The Contractor shall not cause any signs of any kind to be displayed at the site unless specifically required herein or authorized by the Commissioner.
- H. **CONTRACTOR'S SIGN** - The Contractor shall post and keep posted, on the outside of its field office, office or exterior fence or wall at site of work, a legible sign giving full name of the company, address of the company and telephone number(s) of responsible representative(s) of the firm who can be reached in event of an emergency at any time.

1.09 Surveys (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

- A. **LINE AND GRADE** - The City will establish a baseline and bench mark near the site of the work for use of the Contractor in connection with the performance of the work.
- B. **RESPONSIBILITY** - The Contractor shall establish all other lines and elevations required for its work and shall be solely responsible for the accuracy thereof.
- C. **SAFEGUARD ALL POINTS** - Each Contractor shall safeguard all points, stakes, grade marks and bench marks made or established by the Contractor on the work, shall re-establish same if disturbed and bear the entire expense of rectifying the work improperly installed due to not maintaining, not protecting or removing without authorization such established points, stakes, or marks.
- D. **CITY MONUMENTS AND MARKS** - No work shall be performed near City monuments or marks so as to disturb them until the said monuments or marks have been referenced or reset or otherwise disposed of by the relevant Agency or party who installed them.
- E. **FOUNDATIONS** - The Contractor for General Construction Work shall furnish certification from a licensed Surveyor that all portions of the foundation work are located in accordance with the Contract Drawings and at the elevations required thereby. This certification shall show the actual locations and the actual elevations of all the work in relation to the locations and elevations shown on the Contract Drawings, including but not restricted to the following:

1. The locations and elevations of all piles, if any.

2. Elevations of tops of all spread footings, tops of pile caps, and tops of all foundation walls, elevator pit walls and ramp walls.
3. Location of all footing centers and pier centers including those for exterior wall columns.
4. Location of all foundation walls including wall columns, elevator pit walls and ramp walls.

F. **WALL LINES** - After the first courses of masonry or stone have been laid, the Contractor for General Construction Work shall establish the permanent lines of exterior walls. Such Contractor shall furnish promptly, certification from a licensed Surveyor, in the form of signed original drawings showing the exact location of such wall lines, of all portions of all structures. Except at its own risk, the Contractor for General Construction Work shall not proceed further with the erection of walls until the Surveyor's certification has been submitted and verified for correct location of wall lines.

G. **SURVEYOR** - The Surveyor selected for any of the purposes mentioned in Paragraph E and Paragraph F above, and Paragraph I below, shall be a licensed Surveyor and shall be subject to the approval of the Commissioner. The Surveyor shall not be a regular employee of the Contractor, nor shall the Surveyor have any interest in the Contract. The Surveyor shall not be employed by the Contractor in laying out any work, it being intended that the Surveyor's certification shall represent an independent and disinterested verification of such layout. The Surveyor shall report to the Department of Design and Construction's Resident Engineer each time upon arrival to and departure from the site and review with the Resident Engineer the data required for the project.

H. **FINAL CERTIFICATION** - Final certification shall be submitted upon completion of the work or upon completion of any subdivision of the work as directed by the Commissioner. Any exceptions or deviations from the drawings shall be noted on the final certificate and there shall be included any maps, plates, notes, pertinent documents and data necessary, in the opinion of the Commissioner, to constitute a full and complete report.

I. **FINAL SURVEY** - The Contractor for General Construction Work shall submit to the Department of Design and Construction for submission to the Department of Buildings a final Survey by the licensed Surveyor showing the location of the new Structure, before completion of the Structure. This Survey shall show the location of the first tier of beams or of the first floor; the finish grades of the open spaces on the plot; the established curb level and the location of all other Structures on the plan, together with the location and boundaries of the lot or plot upon which the Structure is constructed, curb cuts, all yard dimensions, etc.

1.10 Contractor's Superintendent

A. **SUPERINTENDENT** - The Contractor shall devote its time and personal attention to the work and shall employ and retain at the project site, from the commencement until the entire completion of the work, a Contractor's Superintendent competent and capable of maintaining proper supervision and care of the work and acceptable to the Commissioner, who, in the absence of the Contractor, and irrespective of any superintendent or foreman employed by any subcontractor, shall see that the instructions of the Commissioner are carried out.

B. **REPLACEMENT** - The Contractor's Superintendent on the job shall not be changed or removed without the consent of the Commissioner.

1.11 Permits

The Contractor shall comply with all local, state and federal laws, rules and regulations affecting the Work of this Project, including, without limitation, (1) obtaining all necessary permits for the performance of the Work prior to commencement thereof, and (2) complying with all requirements for the disposal of demolition and/or construction debris, waste, etc., including disposal in City landfills. The Contractor shall be responsible for all costs in connection with such regulatory compliance, unless otherwise specified in the Contract.

1.12 Transportation

- A. AVAILABILITY - It shall be the duty of the Contractor to determine the availability of transportation facilities and dockage for the use of its employees, equipment and material and the conditions under which such use will be permitted.
- B. COSTS - If transportation facilities and dockage are available and are permitted to be used by the governmental agency having jurisdiction, the Contractor shall pay all necessary costs and expenses, and abide by all rules and regulations promulgated in connection therewith.
- C. VEHICLES - With respect to the use of vehicles on highways and bridges, the Contractor's attention is directed to the limitations set forth in the Rules of the City of New York, Title 34, Chapter 4, Section 4-15.
- D. CONTINUED USE - It is understood that the Commissioner makes no warranty as to the continued use by the Contractor of such facilities.

1.13 Sleeves And Hangers (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

- A. COORDINATE TO PROGRESS SCHEDULE - Contractors required to furnish and install conduits, outlets, piping sleeves, boxes, inserts and all other materials and equipment necessary to be built into the work to be performed by the Contractor for General Construction Work, shall promptly furnish and set such sleeves or other materials in conformity with the requirements of the project.
- B. COOPERATION OF CONTRACTORS - All Contractors shall fully cooperate with each other in connection with the performance of the above work as "cutting in" new work is neither contemplated nor will it be tolerated.
- C. TIMELINESS - In the event that timely delivery of sleeves and other materials cannot be made, and to avoid delay, the affected Contractor may arrange to have boxes or other forms set at the locations where the piping or other material is to pass through or into the slabs, walls or other work. Upon the subsequent installation of the sleeves or other material, the Contractor for General Construction Work shall fill around them with materials as required by the Contract. The necessary expenditures incurred for the boxing out and filling in shall be borne by the Contractor or Contractors responsible therefore.
- D. INSERTS - The Contractor for General Construction Work is to install strip inserts four (4) foot on center and perpendicular to beams in ceiling slabs of boiler, machine and mechanical equipment rooms. Inserts are to be installed for strippable concrete slabs only.

1.14 Cutting And Patching

- A. RESPONSIBILITY - Each Contractor shall do all cutting, patching and restoration required by its work, unless otherwise particularly specified in the Specifications of its Contract.
- B. RESTORE WORK - Each Contractor shall restore any work they damage that is the work of another Contractor.
- C. COMPETENT WORKERS - All restoration work shall be done to the satisfaction of the Commissioner by competent workers skilled in the trade required by such restoration. If, in the judgment of the Commissioner, workers engaged in restoration work are incompetent, they shall be replaced immediately by competent workers.
- D. REMOVALS - Each Contractor must remove from the premises all demolished materials of every nature or description resulting from cutting, patching and restoration work, in accordance with the requirements hereinafter stipulated under article on REMOVAL OF RUBBISH AND SURPLUS MATERIALS.

1.15 Temporary Heat (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

A. GENERAL

1. Definition - The provision of Temporary Heat shall mean the provision of heat in order to permit construction to be performed in accordance with the Progress Schedule during all seasons of the year and to protect the work from the harmful effects of low temperature. In the event the building, or any portion thereof, is occupied during construction, the provision of Temporary Heat shall include the provision of heat to permit normal operations in such occupied areas.
 - a. The provision of Temporary Heat shall be in accordance with the temperature requirements set forth in Paragraph (c) below.
 - b. The provision of Temporary Heat shall include the provision of: 1) all fuel necessary and required, 2) all equipment necessary and required, and 3) all operating labor necessary and required. Operating labor shall mean that minimum force required for the safe day to day operation of the system for the provision of Temporary Heat and shall include, without limitation, heating maintenance labor and/or Firewatch as required by NYC Fire Department regulations. Operating labor may be required seven (7) days per week and during other than normal working hours, for the period of time required by seasonal weather conditions.
 - c. In the event the building, or any portion thereof, is occupied and the Project involves the replacement, modification and/or shut down of the permanent heating system, or any key component thereof; and such system is a combined system which furnishes domestic hot water for the building occupants, the provision of Temporary Heat shall include the provision of domestic hot water at the same temperature as the system which is being replaced. Domestic hot water shall be provided in accordance with the phasing requirements set forth in the Contract Documents.
2. Responsibility - The Contractor responsible for the provision of Temporary Heat, and all expenses in connection therewith, shall be as set forth below.
 - a. Projects Involving Enclosure of the Building
 - (1) Prior to Enclosure - Until the Commissioner determines that the building has been enclosed, as set forth in Paragraph (b) below, each Contractor shall be responsible for the provision of its own Temporary Heat.
 - (2) Post Enclosure - Once the Commissioner determines that the building, or any portion thereof, has been enclosed, as set forth in Paragraph B below, the Contractor for Heating, Ventilating and Air Conditioning Work ("HVAC Work") shall be responsible for the provision of Temporary Heat by one or more of the following means: 1) by an existing heating system (if any), 2) by a permanent heating system which is being installed as part of the Project, or 3) by a temporary heating system(s). The Contractor for HVAC Work shall, within two (2) weeks of the kick-off meeting, submit to DDC for review its proposed plan to provide Temporary Heat. Such plan is subject to approval by the Resident Engineer. The Contractor for HVAC Work shall provide Temporary Heat in accordance with the approved plan until written acceptance by the Commissioner of the work of all Contractors, including punch list work, unless directed otherwise in writing by the Commissioner. The responsibility of the Contractor for HVAC Work provided for herein is subject to the exception set forth in Paragraph H.3.b.(2) below.
 - b. Projects not involving Enclosure of the Building
 - (1) If the Project involves the installation of a new permanent heating system if one did not exist previously, or the replacement, modification and/or shut down of the existing

permanent heating system, or any key component thereof, the Contractor for HVAC Work shall be responsible for the provision of Temporary Heat, except as otherwise provided in Paragraph H.3.b.(2) below.

- (2) If the Project does not involve the installation of a new permanent heating system if one did not exist previously, or the replacement, modification and/or shut down of the existing permanent heating system, or any key component thereof; there is no Contractor responsibility of the provision of Temporary Heat, unless otherwise specified in the Contract Documents. However, if the Commissioner, pursuant to Paragraph H.3.b.(1) below, determines that the provision of Temporary Heat is necessary due to special and/or unforeseen circumstances, the Contractor for HVAC Work shall be responsible for the provision of Temporary Heat and such Contractor shall be paid for the same in accordance with Paragraph H.3.b.(1).

B. ENCLOSURE OF STRUCTURES

1. Notification - The Contractor for General Construction Work shall notify all other Contractors and the Resident Engineer at least 30 days prior to the anticipated date that the building(s) will be enclosed.
2. Commissioner Determination - The Commissioner shall determine whether the building, or any portion thereof, has been enclosed. As indicated in Paragraph A above, once the building has been enclosed, the Contractor for HVAC Work shall be responsible for the provision of Temporary Heat. The Commissioner's determination with respect to building enclosure shall be based upon all relevant facts and circumstances; including without limitation, 1) whether the building meets the criteria set forth in Paragraph 3 below, and 2) whether the openings in the building, such as doorways and windows, have been sufficiently covered so as to provide reasonable heat retention and protection from the elements.
3. Criteria for enclosure
 - a. Roof Area
 - (1) A building shall be considered to be roofed when the area to be roofed is covered by a permanent structure and all openings through the permanent structure are covered and protected by temporary covers in Paragraph (c) below.
 - (2) Intermediate floor structures of multi-floor buildings shall be considered to be roofed subject to the same requirements of the building roof.
 - (3) The final roofing system need not be in place for the building or structure to be determined to be enclosed; provided, however, all openings through the permanent structure covering the roof must be covered and protected by temporary covers, as described in Paragraph (c) below.
 - b. Walls - For the walls to be determined to be enclosed, permanent exterior wall elements or facing material must be in place and all openings must be covered and protected by temporary covers, as described in Paragraph (c) below.
 - c. Temporary Covers - In order to be acceptable, temporary covers must be securely fixed to prevent the entrance of rain, snow and direct wind. The minimum material requirements for temporary covers are as follows: 1) minimum 10 mil. plastic, 2) minimum 12 ounce waterproof canvas tarpaulins, or 3) a minimum three-eighths (3/8) inch thickness exterior grade plywood.
 - d. Temporary covers for openings shall be the responsibility of the Contractor for General Construction Work, and such work shall be deemed included in the Contractor for General Construction Work's bid price.

C. TEMPERATURE REQUIREMENTS

1. Unoccupied Buildings - The temperature requirement for the provision of Temporary Heat in unoccupied buildings shall be the GREATER of the following: 1) 50 degrees Fahrenheit, or 2) the temperature requirement for the particular type of work set forth in the Contract Documents.
2. Occupied Buildings - The temperature requirement for the provision of Temporary Heat in occupied buildings, or portions thereof, shall be the GREATER of the following: 68 degrees Fahrenheit or the temperature requirement for the particular type of work set forth in the Contract Documents.

D. DURATION

1. The Contractor for HVAC Work shall be required to provide Temporary Heat until written acceptance by the Commissioner of the work of all Contractors, including punch list work, unless directed otherwise in writing by the Commissioner. The Contractor for HVAC Work shall be responsible for the provision of Temporary Heat for the time specified herein, regardless of any delays in completion of the Project, including delays that result in the commencement of the provision of Temporary Heat during a season that is later than that which may have been originally anticipated. The Contractor for HVAC Work shall include in its Total Bid Price all expenses in connection with the provision of Temporary Heat in accordance with the requirements specified herein.
2. The total Contract duration is set forth in consecutive calendar days in Schedule A of the General Conditions. The Table set forth below indicates the number of full heating seasons that are deemed included in various contract durations, which are specified in consecutive calendar days (ccds). At a minimum, a full heating season shall extend from October 15th to April 15th.

Contract Duration	Full Heating Seasons Required
up to 360 ccds	1 full heating season
360 to 720 ccds	2 full heating seasons
more than 720 ccds	3 full heating seasons

E. METHOD OF TEMPORARY HEAT

1. The method of temporary heat shall be in conformance with all applicable laws, rules and regulations. Prior to implementation, such method shall be subject to the written approval of the Commissioner.
2. The method of temporary heat shall:
 - a. Not cause the deposition of dirt or smudges upon any finished work or cause any defacement or discoloration to the finished work.
 - b. Not be injurious or harmful to people or materials.
3. No open fires will be permitted.
4. Electric heating will not be permitted unless required by Contract Documents and Specifications or otherwise approved by the Commissioner.
5. Direct-fired equipment will be allowed in construction areas where the use of such equipment will not damage or deteriorate the construction or finishes or be harmful to persons working in the area.

F. TEMPORARY HEATING SYSTEM

1. The temporary system for the provision of Temporary Heat provided by the Contractor for HVAC

Work following enclosure of the building shall be complete including, but not limited to, torpedo blowers and/or propane heaters subject to provisions of paragraph E above), boilers and fuel storage, pumps, radiators, unit heaters, water and heating piping, insulation and controls. The temporary system for the provision of Temporary Heat shall be capable of maintaining the minimum temperature requirements set forth in Paragraph C above.

G. THE CONTRACTOR FOR GENERAL CONSTRUCTION WORK

1. The Contractor for General Construction Work shall coordinate with the Contractor for HVAC Work in the work of providing Temporary Heat, and shall so coordinate its operations as to insure sufficient and timely performance of the work under all Contracts. The Contractor for General Construction Work shall supply and pay for all water required and used in the building for the operation of the heating system(s) for the purpose of Temporary Heat. The Contractor for General Construction Work shall include all expenses in connection with the supply of water for Temporary Heat in its Total Bid Price. During the period in which Temporary Heat in an enclosed building is being furnished and maintained by the Contractor for HVAC Work, the Contractor for General Construction Work shall, in order to provide proper ventilating and drying, open and close the windows and other openings when necessary for the proper execution of the work and also when directed by DDC. The Contractor for General Construction Work shall maintain all permanent or temporary enclosures at its own expense.

H. THE CONTRACTOR FOR HVAC WORK

1. Use of Permanent Heating System for Temporary Heat after Building Enclosure

- a. The Contractor for HVAC Work shall provide all labor and materials to promptly furnish and set all required equipment and convectors and/or radiators, piping, valves, fitting, etc., in ample time for their use for the provision of Temporary Heat after enclosure of the building.
- b. New portions of the permanent heating system that are used for furnishing Temporary Heat shall be left in near perfect condition when delivered to the City for operation. Any repairs required, other than for ordinary wear and tear on the equipment, shall be made by the Contractor for HVAC Work at his expense. The starting date for the warranty or guarantee period for such equipment shall be the date of Substantial Completion acceptance.
- c. In the event that the Contractor for HVAC Work does not advance the installation of the permanent heating system in sufficient time to permit its use for Temporary Heat as determined by DDC, the Contractor for HVAC Work shall furnish and install a separate system for the provision of Temporary Heat as required to maintain the minimum temperature requirements set forth in Paragraph C above.

2. All equipment for the system for the provision of Temporary Heat shall be placed so as to comply with the requirements specified hereinbefore, and shall be connected, disconnected and suitably supported and located so as to permit construction work, including finish work such as wall plastering and painting, to proceed. The installation of the system for the provision of Temporary Heat by the Contractor for HVAC Work, including the placing of ancillary system equipment, shall be coordinated with the operations of all Contractors so as to insure sufficient and timely performance of the work of all Contractors. Once the permanent heating system is operating properly, the Contractor for HVAC Work shall remove all portions of the system for Temporary Heat which are not part of the permanent heating system.

3. Temporary Heat Allowance for Special Conditions or and/or Unforeseen Circumstances.

- a. The City has established an allowance in the Contract for HVAC Work for payment of costs and expenses in connection with the provision of Temporary Heat as set forth herein. The amount of such allowance is set forth on the Bid Form for the Contract for HVAC Work and shall be included in the Total Bid Price of the Contractor for HVAC Work. The Contractor for HVAC Work shall only be entitled to payment from this allowance under the conditions and in

accordance with the requirements set forth below. In the event this allowance or any portion thereof remains unexpended at the conclusion of the Contract, such allowance shall remain the sole property of the City. Should the amount of the allowance be insufficient to provide payment for the expenses specified below, the City will increase the amount of the allowance.

- b. The allowance set forth herein may be utilized only under the conditions set forth below.
- (1) In the event the Project does not involve the installation of a new permanent heating system if one did not exist previously, or the replacement, modification and/or shut down of the existing permanent heating system, or any key component thereof, and the Commissioner determines that the provision of Temporary Heat is necessary due to special and/or unforeseen circumstances, the Contractor for HVAC Work shall be responsible for the provision of Temporary Heat, as directed by the Commissioner. The City shall pay such Contractor for all costs for labor, material, and equipment necessary and required for the same. Payment shall be made in accordance with Article 26 of the Contract, except that the cost of fuel shall be as set forth in Paragraph (c) below.
 - (2) In the event that after enclosure of the building, the Commissioner determines that (i) Contractors other than the Contractor for HVAC Work have not sufficiently advanced the work of their contracts that is necessary and required to permit the Contractor for HVAC Work to use the permanent or other heating equipment for the provision of Temporary Heat, and (ii) the Contractor for HVAC Work does not bear any responsibility for such other Contractors' failure to advance the work, the City shall pay the Contractor for HVAC Work for all differential costs for labor, material, and equipment necessary and required for the provision of a substitute system(s) for the provision of Temporary Heat or portions thereof in lieu of the permanent or other systems intended for Temporary Heat. Payment shall be made in accordance with Article 26 of the Contract, except that the cost of fuel shall be as set forth in Paragraph (c) below.
 - (3) In the event the Commissioner determines that there is a need for maintenance of the permanent heating system by the Contractor for HVAC Work after written acceptance by the Commissioner of the work of all Contractors, and that the need for such maintenance is not the fault of the Contractor for HVAC Work, the Contractor for HVAC Work shall provide the required maintenance of the permanent heating system for the period of time directed by the Commissioner. The City shall pay the Contractor for HVAC Work for the cost of direct labor and fuel necessary and required in connection with such maintenance, excluding the cost of any foremen or other supervision. Payment shall be made in accordance with Article 26 of the Contract, except that the cost of fuel shall be as set forth in Paragraph (c) below.
- c. Payment for Fuel Costs - Payment from the allowance set forth herein for the cost of fuel necessary and required to operate the system for the provision of Temporary Heat or to maintain the permanent heating system under the conditions set forth in Paragraph b above shall be limited to the direct cost of such fuel. The Contractor for HVAC Work shall not be entitled to any overhead and/or profit for such fuel costs. In order to receive payment for such fuel costs, the Contractor for HVAC Work must present original invoices for the same. DDC reserves the right to furnish the required fuel.
- d. Deduction - In the event that any amount of the allowance set forth herein is expended for payment to the Contractor for HVAC Work under the circumstances set forth in Paragraph b.(2) above, the Commissioner shall deduct and retain such amount out of moneys that are due and owing hereunder to the other Contractor(s) responsible for the failure to advance the work, as determined by the Commissioner. In the event the amount expended from the allowance exceeds the total sum due and owing to such other Contractor(s), such excess shall be paid to the City by such other Contractor(s) immediately upon demand.

I. THE CONTRACTOR FOR ELECTRICAL WORK

1. The Contractor for Electrical Work shall be responsible for providing the items set forth below and shall include all expenses in connection with such items in its Total Bid Price. The Contractor for Electrical Work shall provide such items promptly when required and shall in all respects coordinate its work with the Contractor for General Construction Work and the Contractor for HVAC Work in order to facilitate the provision of Temporary Heat by the Contractor for HVAC Work.
 - a. The Contractor for Electrical Work shall provide all labor, materials, equipment and power necessary and required to furnish and maintain any temporary or permanent electrical connections to all equipment specified to be connected as part of the work of his Contract.
 - b. The Contractor for Electrical Work shall supply and pay for all power necessary and required for the operation of the system for the provision of Temporary Heat and/or the permanent heating system used for Temporary Heat by the Contractor for HVAC Work. Such power shall be provided by the Contractor for Electrical Work for the duration the Contractor for HVAC Work is required to provide Temporary Heat, as set forth in Paragraph D above.
2. In providing the items set forth in Paragraph 1 above, the Contractor for Electrical Work is advised that labor may be required seven (7) days a week and/or during other than normal working hours for the period of time required by seasonal weather conditions.

J. THE CONTRACTOR FOR PLUMBING WORK

1. The Contractor for Plumbing Work shall be responsible for providing all labor, materials and equipment necessary and required to furnish and maintain all temporary or permanent connections to all equipment or plumbing outlets specified to be provided as part of the work of his Contract. The Contractor for Plumbing Work shall include all expenses in connection with such items of work in its Total Bid Price. The Contractor for Plumbing Work shall provide such items of work promptly when required and shall in all respects coordinate its work with the Contractor for General Construction Work and the Contractor for HVAC Work in order to facilitate the provision of Temporary Heat by the Contractor for HVAC Work.
2. In the event portions of the permanent plumbing equipment furnished by the Contractor for Plumbing Work as part of the work of his Contract are used for the provision of Temporary Heat by the Contractor for HVAC Work, either during construction or prior to acceptance by the City of the complete plumbing system, the Contractor for Plumbing Work shall be responsible to provide such plumbing equipment to the City in near perfect condition and shall make any repairs required, other than for ordinary wear and tear on the equipment, at his expense. The starting date for warranty and/or guarantee period for such plumbing equipment shall be the date of Substantial Completion acceptance by the City.
3. For Projects requiring the installation of new and/or modified gas service, as well as associated meter installations, the Contractor for Plumbing Work shall promptly perform all required filings and coordination with the Utility Companies in order to expedite the installation, testing, and approval of the gas service and associated meter(s).

1.16 Scaffolding and Platforms

- A. **CONFORMANCE:** Unless otherwise indicated, the Contractor for General Construction is responsible for providing, erecting, installing and maintaining all temporary scaffolding and platforms which shall comply with requirements of Chapter 33 (Safeguards During Construction or Demolition) of the NYC Building Code, NYC Local Law 52 of 2005, OSHA Construction Standard 1926 Subpart L, and furnishing the following items.
- B. **RESPONSIBILITY**
 1. A Jobsite Monitor who shall be a competent person, designated and employed by the contractor who has a daily presence on the site during scaffold use. This designee must possess and

maintain a valid New York City Department of Buildings supported scaffold certificate of completion. An alternate shall also be designated, in the event that the Jobsite Monitor is absent. The Jobsite Monitor shall:

- a. Verify completeness of documentation and submittals (as described below).
 - b. Verify that inspections are performed, including pull tests (see below), reports are filed and reported deficiencies are corrected.
 - c. Monitor trades using scaffold.
 - d. Limit access to scaffold areas that are tagged for non-use.
 - e. Inform trades of scaffold load limitations.
 - f. Monitor loading of decks.
 - g. Verify that any ties that are temporarily removed are properly restored in the same shift.
 - h. Verify that outriggers and planks that are moved are properly set up and secured.
 - i. Verify that all scaffold decks in use have proper access/egress.
 - j. Verify that all open sides of decks in excess of 14 inches have proper guardrails and toe-boards.
 - k. Notify appropriate parties, including but not limited to the Resident Engineer, site safety coordinator / monitor, site safety consultant, scaffold users, contractor and the scaffold engineer, of misuses, non-conformances, hazards and accidents.
 - l. Keep a log of significant actions and events connected with the scaffolding.
2. The Contractor shall be responsible for erection, maintenance and dismantling of the scaffold / shed in conformance with the New York City Building Code and OSHA requirements, contract documents and engineering specifications. The Contractor shall also be guided by generally accepted standards of scaffold industry practice as promulgated by the Scaffold Industry Association.
 3. Scaffold Engineer is a New York State licensed PE engaged by the scaffold contractor / erector and responsible to ensure that the installation design conforms to the New York City Building Code and OSHA requirements, that the design comports with the capabilities of the components and the characteristics of the site, that scaffold loads on the host building, including netting, have been properly considered and that the design documents communicate information for erectors and users.
 4. Scaffold users are trade contractors assigned to work on the scaffold. Training certificates from a New York City Department of Buildings approved training provider are mandatory. These users have the duty to become familiar with the New York City Building Code and OSHA requirements germane to users, to obey the instructions of the Jobsite Monitor and inform the Jobsite Monitor of known hazards, non-conformances or violations.

C. JOBSITE DOCUMENTATION AND SUBMITTALS:

1. NYC Department of Buildings permit(s) for scaffold and sidewalk sheds (as applicable) including filing applications signed and sealed by A Professional Engineer licensed in the State of New York;
2. Site logistics plan / site safety plan;
3. Installation drawing(s), design and product data to be provided for all scaffold(s) and shed(s) must include, at a minimum:
 - a. Plan(s);
 - b. Elevation(s);
 - c. Duty load designation; "standard" (150 psf live load) or "heavy duty" (300 psf live load).
 - d. Details including base support, anchors and ties;
 - e. Notes and specifications including load limits, number of planked levels, tie spacing, netting, and sequence of installation and removal.
 - f. Anchorage into sound material.
 - g. Load limits-based on pull tests;
 - h. Specifications for pull test(s), method, proof load and the number of trials;
 - i. Elevations, levels or heights, where anchorage is made into masonry;

- j. Specifications for frames, planks, screw jacks, anchors, and any other ancillary hardware;
- k. Samples for anchors, ties and netting;
- l. Sequence of operations for erection and demolition;
- m. Location plan, heights, widths, "jumps" over doorways and driveways;
- n. Specify size, maximum span and maximum spacing of headers and stringers;
- o. Specify legs, girts, braces, nailing and connections;
- p. All sidewalk sheds shall be designed, engineered, signed and sealed by a Professional Engineer licensed in the State of New York;
 - 1) Generic (not job specific) engineering drawings are satisfactory for standard sheds and arrangements.
 - 2) Special engineering is required for custom sheds, site-specific problems or non-standard arrangements.

D. INSPECTIONS:

1. Signed inspection reports shall be issued for each inspection and pull-test below, and shall be logged and maintained on site by the Jobsite Monitor for the duration of the project.
2. Pull testing shall be required during design, and during or post erection, where anchorage is made into masonry. The Scaffold Engineer shall specify the test method, proof load and the number of trials.
3. Sidewalk sheds shall be inspected after initial installation, major modification, or damage and thence every three months. Inspections shall be by a Scaffold Engineer for custom sheds and by a competent person employed by the Contractor for standard sheds.
4. Scaffolds shall be inspected by the Scaffold Engineer during erection, post-erection and prior to use and thence every three months. The Scaffold Engineer shall repeat inspections after major alteration/modification, damage.
5. A qualified person assigned by the Contractor shall inspect the progress of erection and dismantling, and the condition and integrity of the sidewalk sheds after high winds, major storms and at least once per month during usage.
6. A qualified person assigned by the Contractor shall inspect the progress of erection and dismantling at least weekly, and the condition and integrity of the scaffold after high winds, major storms and at least once per month during usage.
7. Scaffolds shall be inspected daily by the Jobsite Monitor or alternate prior to use by scaffold users.
8. At the completion of the project, submit all inspection documents to the Commissioner for record purposes.

E. LADDERS AND STAIRS: The Contractor for General Construction Work shall provide and maintain ladders or temporary stairs extending from the street to the first story, and to and from every floor and roof level of the project.

F. ACCESS AND EXITS: The ladders or temporary stairs shall be of acceptable size, number and location, so that proper and convenient access may be had by those required to proceed to and from all parts of the project.

1.17 Hoists and Hoistways

A. RESPONSIBILITY - The Contractor for General Construction Work shall provide adequate numbers of material hoists for the most expeditious performance of all parts of its work. All other Contractors are required to provide their own facilities for the hoisting of materials under their respective Contracts. However, these Contractors may make arrangements, whenever possible, with the Contractor for General Construction Work for the use of its hoist upon such terms and conditions as it may prescribe.

- B. LOCATIONS - No hoists shall be constructed at such locations as will interfere with, or affect the construction of, floor arches, or the work of other Contractors. The hoists may be located at the exterior sides of the structure or in the courtyard and extend upward adjacent to the line of window openings. The hoists shall be located a sufficient distance from the exterior walls and be so protected as to prevent any of the permanent work from being damaged, stained or marred.
- C. ELEVATOR SHAFT - Wherever possible, one or more of the permanent elevator shafts may be used as temporary hoistways providing such use meets with the Building Code of the City of New York and the approval of the Commissioner, and providing further it entails no interference with the progress of the work of any Contractor.
- D. PROTECTION FOR INTERIOR HOISTS - All interior material hoistways shall be enclosed on each floor and shall be adequately protected with appropriate safety guards. In no event shall the protection be less than that required by law.

1.18 Certificates of Approval

- A. RESPONSIBILITY - Each Contractor shall be responsible for and shall obtain all final approvals for the work installed under its Contract in the form of such certificates that are required by all governmental agencies having jurisdiction over the work of the Contract.
- B. TRANSMITTAL - All such certificates shall be forwarded to the Commissioner through the Resident Engineer before final acceptance of the work of the Contract.

1.19 Acceptance Tests

- A. GOVERNMENTAL AGENCIES - All equipment and appliances furnished and installed under the Contract shall conform with the requirements of the Specifications, and shall in no event be less than that necessary to comply with the minimum requirements of the law and all of the governmental agencies having jurisdiction.
- B. NOTICE OF TEST - Whenever the Specifications and/or any governmental agency having jurisdiction requires the acceptance test, the Contractor shall give written notice to all concerned of the time when these tests will be conducted.
- C. ENERGY - The City will furnish all energy, fuel, water and light required for tests.
- D. LABOR AND MATERIALS - The Contractor shall furnish labor and all other material and instruments necessary to conduct the acceptance tests at no additional cost to the City.
- E. CERTIFICATES - The final acceptance by the Commissioner shall be contingent upon the Contractor delivering to the Commissioner all necessary certificates evidencing compliance in every respect with the requirements of the regulatory agencies having jurisdiction.
- F. RESULTS - If the results of tests and Controlled Inspections indicate that the material or procedures do not meet requirements as set forth on the Contract Drawings or in the Specifications or are otherwise unsatisfactory, the Contractor shall only proceed as directed by the Resident Engineer. Additional costs resulting from retesting, reinspecting, replacing of material and/or damage to the work of other trades and any delay caused to the schedule shall be borne by the Contractor.

1.20 Progress Photographs (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

- A. PHOTOGRAPHER - The Contractor for General Construction Work shall employ and pay for the services of a competent photographer who shall take photographs showing the progress of the work.
- B. PHOTOGRAPHS - There shall be four (4) photographs taken each month from the commencement of the Contract to the time of completion. These photographs shall show as far as possible, the work

completed within and on the exterior of the structure. The first series of photographs shall be taken prior to the actual commencement of work at the site. In addition thereto before final payment, there shall be six (6) photographs taken of unobstructed views of the completed project or projects and site, as directed by the Commissioner and after all scaffolding, hoists, shanties, field offices or other temporary work has been removed and final cleaning done. (For demolition work included in the Contract there shall be four (4) photographs taken before commencement of demolition operations; four (4) at the mid-point of operations; and four (4) at the completion of demolition operations). The prints shall be 8" x 10" gloss finish, mounted with a one (1) inch binding flap of muslin on the left side. They shall be marked on the back with date of exposure; the title of the project; and the specific location. Three (3) copies of each photograph shall be furnished free of charge to the Department of Design and Construction. Photographs shall be taken as ordered by the Commissioner.

1.21 Job Meetings

- A. **MEETINGS SCHEDULE** - Meetings shall be held as scheduled by the Resident Engineer in his office at the site, at which time Contractors for all separate Contracts shall have their representatives present to discuss all details relative to the execution of the work.
- B. **ACCOMODATIONS** - The Contractor for General Construction Work shall provide ample tables and chairs to accommodate all present at the meetings, and table space for Contract Drawings.
- C. **AGENDA** - The Resident Engineer shall preside over these meetings. Prior to each meeting, the Resident Engineer will consult with the Contractors and will prepare an agenda of items to be discussed. In general, after informal discussion of any item on the agenda, the Resident Engineer will summarize the discussion in a brief written statement, and each Contractor will then dictate a brief statement for the record.

The Contractor for General Construction Work shall furnish all necessary typing and printing of the minutes prepared by the Consultant Architect/Engineer. Ample copies of the printed minutes shall be furnished to the Resident Engineer for distribution to all Contractors and representatives of the Commissioner.

- D. **COORDINATION** - Job meetings shall also be called by the Contractor for General Construction Work for the purpose of coordinating, expediting and scheduling the work of all Contracts in accordance with the master coordinated Job Progress Chart. All Contractors and their subcontractors, material suppliers or vendors whose presence is necessary, are required to attend. These meetings may, at the discretion of the Contractor for General Construction Work, be held at the same place and immediately following the Job Meetings held by the Resident Engineer. Minutes of these meetings shall be recorded, typed and printed by the Contractor for General Construction Work and distributed to all parties concerned.

1.22 Guarantees and Warranties - Refer to the Addendum to the General Conditions for the applicability of this article.

- A. **SCHEDULE B** - Requirements for guarantees and warranties for the Project are set forth in Schedule B, which is included as part of the Addendum to the General Conditions.
- B. **FORM** - For all guarantee requirements set forth in Schedule B, the Contractor shall provide a written guaranty, in the form set forth on the following page.

GUARANTY

DDC PROJECT # _____

PROJECT DESCRIPTION _____

CONTRACT # _____

SPECIFICATION SECTION # AND TITLE _____

GUARANTY TO BE IN EFFECT FROM _____

TO _____

The Contractor hereby guarantees that the work specified under the above section of the aforesaid Contract will be free from defects of material and/or workmanship, for the period indicated above.

The Contractor also guarantees that it will promptly repair, restore, rebuild or replace whichever may be deemed necessary by the City, any or all defective material or workmanship of the aforementioned section, that may appear within the guaranty period and any finished work to which damage may occur because of such defects, to the satisfaction of the City and without any cost or expense to the City.

The Contractor hereby agrees to pay to the City the cost of the repairs or replacements should the City make the same because of the failure of the Contractor to do so.

Contractor

By

Subscribed and sworn to before me this

day of _____, year _____

Notary Public

1.23 Removal of Rubbish and Surplus Materials

- A. **RUBBISH** - Rubbish shall not be thrown from the windows or other parts of the project. Mason's rubbish, dirt and other dust-producing material shall be wetted down periodically.
- B. **LOCATION** - Each Contractor shall sweep up and deposit, at a location designated on each floor by the Contractor for General Construction Work, all of its rubbish, debris and waste materials, as it accumulates and when directed by the Resident Engineer. Wood cratings shall be broken up, neatly bundled, tied and stacked ready for removal and be deposited at a location designated on each floor by the Contractor for General Construction Work.
- C. **LABORERS** - The Contractor for General Construction Work shall be responsible for the removal of all rubbish, etc., from the site. The Contractor shall remove from the designated locations all piles of rubbish, debris, waste material and wood cratings as they accumulate and when directed by the Resident Engineer, and shall remove them from the site. The Contractor shall employ and keep engaged for this purpose an adequate number of laborers.
- D. **SURPLUS MATERIALS** - Each Contractor shall remove from the site all surplus materials when there is no further use for same.
- E. **TOOLS AND MATERIALS** - At the conclusion of the work, all erection plant, tools, temporary structures and materials belonging to the Contractor shall be promptly removed.

1.24 Cleaning

Each Contractor shall thoroughly clean all equipment and materials furnished and installed and shall deliver such materials and equipment undamaged in a clean and new appearing condition at time of substantial completion.

1.25 Inspections by Other City Agencies

- A. **LETTER OF COMPLETION** - Just prior to substantial completion of this Project, the Commissioner will file with the Department of Buildings, an application for a Letter of Completion or a Certificate of Occupancy for the structure.
- B. **FINAL INSPECTIONS** - In connection with the above mentioned application for a Letter of Completion or a Certificate of Occupancy and before certificates of final payments are issued, each Contractor will be required to arrange for all final inspections by the inspectional staff of the Department of Buildings or other governmental agencies having jurisdiction, and secure all reports, sign offs, certificates, etc., by such inspection staff or other governmental agencies, in order that a Letter of Completion or Certificate of Occupancy can be issued promptly.

1.26 Security Guards/Fire Guards on the Site (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

A. SECURITY GUARDS (WATCHMEN)

1. The Contractor for General Construction Work shall provide competent Security Guards on the site until final completion of the project or earlier if so notified in writing by the Commissioner. The Security Service shall commence with the start of work. There shall be no less than one (1) Security Guard on duty every day, including Saturdays, Sunday and Holidays, 24 hours a day, except between the hours of 8:00 A.M. and 4:00 P.M. on any day which is a regular working day for a majority of the trades. This exception during the working day shall not apply after the finishing painting of the plaster work is commenced; thereafter, not less than one (1) Security Guard shall be on duty continuously, 24 hours a day, until final completion of the project or earlier if so notified in writing by the Commissioner.

2. Every Security Guard shall be required to hold a "Certificate of Fitness" issued by the Fire Department. Every Security Guard shall, during their tour of duty, perform the duties of Fire Guard in addition to their security obligations.
3. Should the Commissioner find that any Security Guard is unsatisfactory, such guard shall be replaced by the Contractor for General Construction Work upon the written demand of the Commissioner.
4. Each Security Guard furnished by the Contractor for General Construction Work shall be instructed by the Contractor for General Construction Work to include in their duties the entire construction site including the Field Office, temporary structures, and equipment, materials, etc.
5. Should the Contractor for General Construction Work or any other Contractor consider the security requirements outlined above inadequate, it shall provide such additional security as it thinks necessary, after obtaining the written consent of the Commissioner. The additional cost of such approved increased protection will be paid by the Contractor who provides the additional protection.
6. Nothing contained in this Article shall diminish in any way the responsibility of each Contractor for its own work, materials, tools, equipment, nor for any of the other risks and obligations outlined hereinbefore in this Article.

B. **COSTS** - The Contractor for General Construction Work shall employ Security Guards/Fire Guards at all times, except as otherwise modified by the detailed Specifications and as approved by the Commissioner, for the purpose of safeguarding and protecting the site. All costs for Security Guards/Fire Guards shall be borne by the Contractor for General Construction Work.

C. **RESPONSIBILITY** - All Contractors will be responsible for safeguarding and protecting their own work, materials, tools and equipment.

1.27 Contractor's Daily Reports

A. **DAILY REPORTS** - As soon as the Contractor has started work on the Project, it shall submit to the Resident Engineer written daily reports of the work performed the previous day by any of its employees, including the employees of its subcontractors.

B. **INFORMATION** - The reports shall be prepared by the Contractor's Superintendent and shall bear the Contractor's Superintendent signature. Each report shall contain the following information:

1. The type of materials and/or major equipment being installed by the Contractor and the total number of employees working in each category on that particular day.
2. The names of the subcontractors working and the type of materials and/or major equipment being installed by each, together with the total number of employees working for each subcontractor on that particular day.
3. The major construction equipment being used by each Contractor and/or subcontractor.

1.28 Alternate or Substitute Equipment

A. In general, the Contract Drawings and Specifications show and describe arrangements suitable for the specific items of equipment either named or described. In the event that a Contractor submits for approval, and receives such approval, a device or piece of equipment which requires connections (vacuum, gas, steam, water, air, electric, etc.) or arrangements of these services, differing from those indicated or described in the Contract Documents, it shall be incumbent upon the Contractor submitting the alternate or substitute equipment to give timely notice to the other Contractors involved so that they may make suitable alterations in the work to accommodate the substitute or alternate equipment. The Contractor making the substitution shall be responsible for any and all additional

costs incurred by any of the Contractors by virtue of the substitution of equipment for the equipment named or described in the Contract Documents.

1.29 Sleeve and Penetration Drawings (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

- A. As soon as practicable after the commencement of work and when the order in which concrete for the first slabs, walls, etc. to be poured is determined, the Contractors for the engineering trades (Plumbing, Heating, Ventilating and Air Conditioning, and Electrical) shall submit to the Department of Design and Construction a sketch indicating the location and size of all penetrations for sleeves, ducts, etc. which will be required to accommodate the mechanical trades, in order that it may be determined if such penetrations will materially weaken the project's structure. The sketch will be stamped and returned if approved and/or comments will be transmitted. The engineering Contractors shall continue to submit sketches as the pouring schedule and the concrete work progresses and, until approvals for the penetration sketches have been given, shall not predicate their layout work on unapproved sketches.

1.30 Location of Partitions (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

- A. Within three (3) weeks after the concrete slabs have been poured on each floor level, the Contractor for General Construction Work shall immediately locate accurately all of the partitions, including the door openings, on the floor slabs in a manner approved by the Resident Engineer.

1.31 Furniture and Equipment

- A. **RESPONSIBILITY** - Each Contractor is responsible for moving all loose furniture and/or equipment in all areas when such furniture and/or equipment interferes with the proper performance of its work.
- B. **PROTECTION** - All such furniture and/or equipment must be adequately protected with dust cloths and returned to their original locations when directed to do so by the Resident Engineer.

1.32 Overtime Work (Ordered by Commissioner)

- A. **OVERTIME** - The Commissioner reserves right to order and pay for overtime work.
1. The Commissioner can order overtime work when in the Commissioner's opinion, delay occurs and such delay is not the fault of the Contractor, or
 2. When work is of such an important nature that delay in carrying such work to completion would result in serious disadvantage to the public.
- B. **ORDER FOR OVERTIME WORK** - When overtime work is ordered by the Commissioner, such "Order" will be issued by the Commissioner on a special form letter over the signature of the Commissioner.
- C. **CONTRACTOR'S PROCEDURE PRIOR TO COMMENCING WORK**
1. Make immediate application to the Commissioner of Department of Labor, State of New York, for dispensation in accordance with Subdivision 2 of Section 220 of the Labor Law.
 2. Upon receipt of such dispensation, proceed expeditiously with ordered overtime work.

1.33 Compliance with OSHA Regulations

These Contract Documents and the work hereby contemplated shall be governed, at all times, by the following Federal Laws:

- A. William Steiger Occupational Safety and Health Act of 1970, Public Law 91-596;

- B. Part 1910 - Occupational Safety and Health Standards, Chapter XVII of Title 29, Code of Federal Regulations;
- C. Part 1926 - Safety and Health Regulations for Construction, Chapter XVII of Title 29, Code of Federal Regulations.

1.34 Temporary Services

PART A (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

- A. TEMPORARY WATER - during construction shall be furnished in the following manner:
 - 1. Immediately after the Contractor for General Construction Work has been ordered by the Commissioner to start work, it shall file an application with the Dept. of Environmental Protection for the schedule of charges for water use during construction. The Contractor for General Construction Work will be responsible for payment of water charges.
 - 2. Immediately after the Contractor for Plumbing Work has been ordered by the Commissioner to start work, it shall file an application with the Department of Environmental Protection's Bureau of Water Supply and obtain its permit to install the temporary water supply system. The system shall be installed and maintained for the use of all Contractors. A copy of the above mentioned permit shall be filed with the Commissioner. The Contractor for Plumbing Work shall provide temporary water main, risers and waste stacks as directed and install on each floor, outlets with two (2) 3/4" hose valve connections over a barrel installed on a steel pan. The Contractor for Plumbing Work shall provide drains from the pans to the stack and house sewer and hose bibs to drain the water supply risers and mains. During winter months the Contractor for Plumbing Work shall take the necessary precautions to prevent the temporary systems from freezing.
- B. TOILET FACILITIES - both exterior and interior, for the use of all Contractors, shall be furnished and installed in the following manner:
 - 1. Toilet fixtures shall be furnished, installed and maintained in a satisfactory operating condition by the Contractor for Plumbing Work.
 - 2. Enclosures for the toilet fixtures shall be erected and maintained by the Contractor for General Construction Work.
 - 3. Heating for the enclosures shall be furnished, installed and maintained by the Contractor for General Construction Work.
 - 4. Electric lighting for the enclosures shall be furnished, installed and maintained by the Contractor for Electrical Work.
 - 5. The Contractor for General Construction Work shall keep the temporary toilet fixtures and enclosures in a clean and sanitary manner.
 - 6. No Contractor shall cause any sanitary nuisances to be committed by its employees in or about the work. Each Contractor shall enforce all sanitary regulations of the City and State Health Authorities.
- C. OVERTIME USE - Whenever any Contractor(s) work before or after the regular work hours hereinafter specified under Subparagraph D, or on a Saturday, Sunday or Holiday of any trade, such Contractor(s) shall pay the Contractor for Plumbing Work for the activation of the temporary water system and toilet facility services during such overtime periods. When more than one (1) Contractor is involved in overtime work, the costs thereof shall be prorated as determined by the Resident Engineer. When overtime is required by any or all Contractors on the work, the provisions for payment for regular time use of the temporary water supply system as specified in Subparagraph D shall apply.

- D. **ACTIVATION** - The Contractor for Plumbing Work shall bear the cost of keeping the temporary water supply system activated from a period of time 15 minutes before the established starting time of that trade which starts work earliest in the morning, to 15 minutes after the established quitting time of that trade which stops work latest in the evening. This applies to every day in the week which is established as a regular working day for aforementioned trades and holds until completion and final acceptance of the work of the Contractor for Plumbing Work or until the services are terminated by instructions from the Commissioner.

PART B (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

- A. **WATER** - The Contractor for General Construction Work will be responsible for payment of water charges. Billing will be in accordance with the Department of Environmental Protection schedule of charges for Building Purposes.
- B. **ELECTRICITY** - for temporary light and the operation of small tools, is available in the area of this project and will be furnished to the Contractor for General Construction Work by the Contractor for Electrical Work without cost.
- C. **TOILET FACILITIES** - The Contractor for General Construction Work shall arrange with the Commissioner for the temporary use of certain toilets or washrooms within the project for the use of all employees during the execution of the work.
- D. **MAINTENANCE** - The Contractor for General Construction Work shall maintain the temporary toilet facilities in a clean and sanitary manner and make all necessary repairs due to misuse.
- E. **NUISANCES** - The Contractors shall not cause any sanitary nuisance to be committed by its employees in or about the work, and shall enforce all sanitary regulations of the City and State Health Authorities.

1.35 Temporary Use, Operation and Maintenance of Elevators during Construction

PART A - FOR NEW BUILDINGS UP TO AND INCLUDING 15 STORIES (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

- A. **INSTALLATION** - The Contractor for General Construction Work shall install and complete, as indicated herein, one (1) selected main elevator in the Project for temporary operation by the Contractor for General Construction Work for the transporting of employees of all Contractors and representatives of the Department of Design and Construction and other Governmental Agencies having jurisdiction of work at the project. The Contractor for General Construction Work shall furnish, install and maintain for such elevators, all necessary hoisting ropes, governor cables, traveling conductor cables, operating devices, temporary hand reset target annunciators, temporary signal devices, and all other permanent or temporary parts. The installation and maintenance of the temporary elevator and all equipment and/or parts utilized in connection therewith shall be in accordance with the rules and regulations of all agencies and/or entities having jurisdiction over elevators in temporary use.
- B. **RESPONSIBILITY** - The Contractor for General Construction shall be responsible for any injury to persons or damage to property arising out of the temporary elevator and all equipment and/or parts utilized in connection therewith. The Contractor for General Construction shall employ and pay wages, including overtime wages if necessary, for all workers required for the operation and maintenance of the temporary elevator. The Contractor for General Construction shall be responsible for all costs for: (1) the installation of the temporary elevator, (2) maintaining the temporary elevator in clean, proper operating condition, including the cost of lubricants and/or parts for such maintenance, (3) all work in pits, shaftways and machine rooms necessary for the operation of the elevator, and (4) the replacement of the temporary elevator or parts utilized in connection therewith, if required.

C. **ACTIVATION TIME** - The Contractor for General Construction Work shall keep the temporary elevator activated from a period of time 15 minutes before the established starting time of that trade which starts work earliest in the morning to 15 minutes after the established quitting time of that trade which stops work latest in the evening. This applies to every day in the week, which is established as a regular working day for the aforementioned trades.

D. **COMMENCEMENT OF SERVICE** - The Contractor for General Construction Work shall begin to provide temporary elevator service using the selected main passenger elevator no later than eight (8) weeks (40 working days) after the machine room roof slab, or that portion of it surrounding the elevator shaft, has been placed. No later than three (3) weeks (15 working days) after the machine room roof slab, or that portion of it surrounding the elevator shaft, has been placed the following work shall have been completed:

1. The shaft shall have been completely enclosed by either the permanent or a temporary enclosure meeting the requirements of the law.
2. The machine room shall have been made completely watertight either by permanent or temporary construction. Beams or other devices, either permanent or temporary shall be provided which will enable the safe and practicable hoisting of the elevator machinery for installation.
3. There shall have been installed on all floors at the shaftway entrances to the elevator, solid substantial frames and either sliding or swing doors with substantial hardware and door locks and any necessary approved wire mesh barricades for adjacent shaftways.
4. There shall have been furnished and installed solid substantial enclosures at front, back, sides and top of car platform enclosure, with emergency exit at top of car, excepting that the portion of the front at the elevator entrance shall have been provided with a substantial temporary door or gate.

E. **ELECTRICAL INSTALLATION** - The Contractor for Electrical Work, not later than 20 calendar days after the machine room roof slab or that portion of its surrounding the elevator has been placed, shall have furnished and installed temporary or permanent power and light feeders as required for the elevator used for temporary service and shall have connected such feeders to the terminals on the starter panels or controllers in the machine room to the low voltage transformers and car light outlets in the center of shaftway and for the car control and signal traveling cables. The Contractor for Electrical Work shall make all these required connections as soon as the equipment is declared ready for such connections by the Resident Engineer. The cost of this work shall be included in the Contractor for Electrical Work's Contract.

F. **REMOVAL** - When elevators for permanent use have been installed and are in condition for service, and when directed by the Commissioner, the Contractor for General Construction Work shall remove the temporary enclosures and all temporary elevator equipment and promptly proceed with the installation of the permanent equipment as is required under the Contract.

G. **INSPECTION** - Before temporary elevator equipment has been removed, a joint inspection of the equipment shall be made by the Contractor for General Construction Work and the Commissioner to determine the condition of this equipment upon the discontinuation of its temporary use. If this inspection deems it necessary, the Contractor for General Construction Work shall furnish and install new governor and compensating ropes, new traveling cables and new controller parts, etc. The car and counterweight safeties shall be thoroughly cleaned of all dirt and all foreign matter, then properly lubricated and placed in good operating condition to the satisfaction of the Commissioner. If it is determined and ordered by the Commissioner that new hoist ropes are required, such ropes shall be installed and payment therefor will be made in accordance with Article 26 of the Contract.

H. **REPLACEMENT** - The Contractor for General Construction Work shall replace with new, any of the equipment or parts of the temporary elevator installation that were damaged, destroyed, or that indicate excessive wear or corrosion excepting the replacement of hoisting ropes. All shaftways, pits, motor rooms and sheave spaces used for temporary operation of elevators shall be thoroughly

cleaned. Where lubricated rails are used they shall be washed down. If roller guides are used, all rust, dirt, etc., must be moved from the rails. The full cost of parts replacement, cleaning, etc., shall be borne by the Contractor for General Construction Work except for the replacement of hoisting ropes.

- I. **COSTS** - The Contractor for Electrical Work shall pay the costs of all electrical current used for operating the temporary elevators. The Contractor for General Construction Work shall provide all necessary conduit and wiring connections for the proper operation of the elevator and the signaling of the temporary elevators.
- J. **LIMITATIONS OF USE** - The temporary elevator shall not be used during its operation for hoisting of materials or removal of rubbish, but shall be limited only to the transportation of employees of all Contractors and the representatives of City Departments and other Governmental Agencies having jurisdiction of work at the project. However, the Resident Engineer may grant special permission at specified times to the various Contractors to hoist materials, which in the Resident Engineer's opinion will not overload or damage the elevator installation, but only after such times as all plastering has been completed from the second floor up. The particular Contractor using the elevator for the hoisting of its material shall be responsible for any damage to the elevator during the entire period of such use. The Contractor for General Construction Work shall give notification in writing to the Resident Engineer of any alleged damage to the elevator installation within 24 hours after the elevator has been employed for the hoisting of materials by the particular Contractor(s).
- K. **PAYMENT FOR USE** - The Contractor for General Construction Work shall be paid for its operation and maintenance of the temporary elevator or permanent elevator used for temporary service at the daily rate indicated under the Item of its Contract. All other costs in connection with the elevator installation and equipment, excepting electrical work done by the Contractor for Electrical Work under its Contract, shall be included in the Contractor for General Construction Work's Contract.
- L. **LIQUIDATED DAMAGES** - The Contractor for General Construction Work will be charged at the rate of \$100 per day for each day it fails to provide the temporary elevator service described in this section beginning with the 4th working day after the machine room roof slab, or that portion of it surrounding the elevator shaft, has been placed and stripped. This charge will be deducted from any amount due and owing to the Contractor for General Construction Work.
- M. **OVERTIME USE** - All Contracts. Whenever any Contractor or Contractors work before or after the regular work hours as indicated in Paragraph B above, or on a Saturday, Sunday or Holiday, such Contractor or Contractors shall pay the Contractor for General Construction Work for the operation and maintenance of the temporary elevator, if required by such Contractor or Contractors, at the daily rate indicated in the Contract but increased to reflect the difference between regular wage rates and overtime wage rates. The basic hourly charge shall be considered as one ninth (1/9) of the amount shown in the Item of the Bid form of the General Construction Work Contract. The City will not pay any Contractor for such overtime use of the elevator. When more than one (1) Contractor is involved in the overtime work, the charges shall be prorated as determined by the Resident Engineer unless otherwise agreed mutually among all the Contractors involved.

PART B - FOR NEW BUILDINGS OVER 15 STORIES (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

- A. **INSTALLATION** - The Contractor for General Construction Work shall install and complete, as indicated herein, two (2) selected main elevators in the Project for temporary operation by the Contractor for General Construction Work for the transporting of employees of all Contractors and representatives of the Department of Design and Construction and other Governmental Agencies having jurisdiction over work at the project. The Contractor for General Construction Work shall furnish, install and maintain for such elevators; all necessary hoisting ropes, governor cables, traveling conductor cables, operating devices, temporary hand reset target annunciators, temporary signal devices and all other permanent or temporary parts. The installation and maintenance of the temporary elevator and all equipment and/or parts utilized in connection therewith shall be in accordance with the rules and regulations of all agencies and/or entities having jurisdiction over elevators in temporary use. The two (2) elevators will not be operated simultaneously.

- B. RESPONSIBILITY** - The Contractor for General Construction shall be responsible for any injury to persons or damage to property arising out of the temporary elevator and all equipment and/or parts utilized in connection therewith. The Contractor for General Construction shall employ and pay wages, including overtime wages if necessary, for all workers required for the operation and maintenance of the temporary elevator. The Contractor for General Construction shall be responsible for all costs for: (1) the installation of the temporary elevator, (2) maintaining the temporary elevator in clean, proper operating condition, including the cost of lubricants and/or parts for such maintenance, (3) all work in pits, shaftways and machine rooms necessary for the operation of the elevator, and (4) the replacement of the temporary elevator or parts utilized in connection therewith, if required.
- C. ACTIVATION TIME** - The Contractor for General Construction Work shall keep the temporary elevator activated from a period of time 15 minutes before the established starting time of that trade which starts work earliest in the morning to 15 minutes after the established quitting time of that trade which stops work latest in the evening. This applies to every day in the week, which is established as a regular working day for the aforementioned trades.
- D. LOW RISE ELEVATOR** - The Contractor for General Construction Work shall begin to provide temporary elevator service using one (1) selected main passenger elevator no later than six (6) weeks (30 working days) after the 12th Floor slab, or that portion of it surrounding the elevator shaft, has been placed and stripped. No later than one (1) week, five (5) working days, after the 12th Floor slab, or that portion of it surrounding the elevator shaft, has been placed and stripped the following work shall have been completed:
1. The shaft shall have been completely enclosed up to the 12th Floor by either the permanent or a temporary enclosure meeting the requirements of the law.
 2. A temporary machine room enclosure shall have been provided at the 11th Floor and shall have been made completely watertight either by permanent or temporary construction. Beams or other devices, either permanent or temporary, shall be provided which will enable the safe and practicable hoisting of the elevator machinery for installation.
 3. There shall have been installed on all floors up to and including the 9th Floor at the shaft entrances to the elevator, solid substantial wood frames and either sliding or swing doors with substantial hardware and door locks, also any necessary approved wire mesh barricades for adjacent shaftways.
 4. There shall have been furnished and installed solid substantial enclosures at front, back, sides and top of car platform enclosure, with an emergency exit at top of car, excepting that the portion of the front at the elevator entrance shall have been provided with a substantial temporary door or gate.
- E. ELECTRICAL INSTALLATION** - The Contractor for Electrical Work, not later than 10 calendar days after the 12th Floor slab or that portion of it surrounding the elevator, has been poured and stripped, shall have furnished and installed temporary or permanent power and light feeders as required for the elevator used for temporary service and shall have connected such feeders to the terminals on the starter panels or controllers in the temporary machine room, to the low voltage transformers and car light outlets in the center of the shaftway and for the car control and signal traveling cables. The Contractor for Electrical Work shall make all these required connections as soon as the Equipment is declared ready for such connections by the Resident Engineer. The cost of this work shall be included in the Contractor for Electrical Work's Contract.
- F. HIGH RISE ELEVATOR** - The Contractor for General Construction Work shall begin to provide temporary elevator service to all floors, using a selected main passenger elevator, no later than eight (8) weeks (40 working days) after the machine room roof slab, or that portion of it surrounding the elevator shaft, has been placed. No later than three (3) weeks (15 working days) after the machine room roof slab, or that portion of it surrounding the elevator shaft, has been placed, the following work shall have been completed:

1. The shaft shall have been completely enclosed by either the permanent or temporary enclosure, meeting the requirements of the law.
 2. The machine room shall have been made completely watertight either by permanent or temporary construction. Beams or other devices, either permanent or temporary shall be provided which will enable the safe and practicable hoisting of the elevator machinery for installation.
 3. There shall have been installed on all floors at the shaftway entrances to the elevator, solid substantial frames and either sliding or swing doors with substantial hardware and door locks, also any necessary approved wire mesh barricades for adjacent shaftways.
 4. There shall have been furnished and installed, solid substantial enclosures at front, back, sides and top of car platform enclosure, with an emergency exit at top of car, excepting that the portion of the front at the elevator entrance shall have been provided with a substantial temporary door or gate.
- G. The Contractor for Electrical Work, not later than 20 calendar days after the machine room slab or that portion of it surrounding the elevator shaft has been placed, shall have furnished and installed temporary or permanent power and light feeders as required for the high rise elevator to be used for temporary service and shall have connected such feeders to the terminals on the motor-generator starter panels or controllers in the machine room, to the signal circuits low voltage transformers for the annunciators and car light outlets in the center of shaftway.
- The Contractor for Electrical Work shall make all these required connections as soon as the equipment is declared ready for such connections by the Resident Engineer. The cost of this work shall be included in the Contractor for Electrical Work's Contract.
- H. When the high rise elevator is completed and ready for temporary operation, the low rise temporary elevator shall be shut down.
- I. When one (1) or more elevators for permanent use have been installed and are in condition for service, and when directed by the Commissioner, the Contractor for General Construction Work shall remove the temporary enclosures and all temporary elevator equipment, and promptly proceed with the installation of the permanent equipment as is required under the Contract.
- J. Before temporary elevator equipment has been removed, a joint inspection of the equipment shall be made by the Contractor for General Construction Work and the Commissioner to determine the condition of this equipment upon the discontinuation of its temporary use. If this inspection determines it necessary, the Contractor for General Construction Work shall furnish and install new governor and compensating ropes, new traveling cables, new controller parts, etc. The car and counterweight safeties shall be thoroughly cleaned of all dirt and all foreign matter, then properly lubricated and placed in good operating condition to the satisfaction of the Commissioner. If it is determined and ordered by the Commissioner that new hoist ropes are required, such ropes shall be installed and payment therefor will be made in accordance with Article 26 of the Contract.
- K. The Contractor for General Construction Work shall replace with new, any of the equipment or parts of the temporary elevator installations that were damaged, destroyed, or that indicate excessive wear or corrosion excepting the replacement of hoisting ropes. All shaftways, pits, motor rooms and sheaves spaces used for temporary operation of elevators shall be thoroughly cleaned down. Where lubricated rails are used they shall be washed down, if roller guides are used, all rust, dirt, etc., must be removed from the rails. The full cost of parts replacement cleaning, etc., shall be borne by the Contractor for General Construction Work except for the replacement of hoisting ropes.
- L. The Contractor for Electrical Work shall pay the costs of all electrical current used for operating the temporary elevators. The Contractor for General Construction Work shall provide all necessary conduits and wiring connections for the proper operation of the elevators and the signaling of the temporary elevators.

- M. No temporary elevator shall be used during its operation for hoisting of materials or removal of rubbish, but shall be limited only to the transportation of employees of all Contractors and the representatives of City Departments and other governmental agencies having jurisdiction of work at the project. However, the Resident Engineer may grant special permission at specific times to the various Contractors to hoist materials which, in the Resident Engineer's opinion, will not overload or damage the elevator installation, but only after such time as all plastering has been completed from the second floor up. The particular Contractor using the elevator for the hoisting of its material shall be responsible for any damage to the elevator during the entire period of such use. The Contractor for General Construction Work shall give notification in writing to the Resident Engineer of any alleged damage to the elevator installation within 24 hours after the elevator has been employed for the hoisting of materials by the other Contractors.
- N. The Contractor for General Construction Work shall be paid for its operation and maintenance of each temporary elevator or permanent elevator used for temporary service at the daily rate indicated under the item of its Contract. All other costs in connection with elevator installation and equipment, excepting Electrical Work done by the Contractor for Electrical Work under its Contract, shall be included in the Contractor for General Construction Work's Contract.
- O. LIQUIDATED DAMAGES - The Contractor for General Construction Work will be charged at the rate of \$100 per day for each day it fails to provide the temporary elevator service described in this Section beginning with the 31st working day after the 12th Floor slab, or that portion of the 12th Floor slab surrounding the elevator shaft, has been placed and stripped. This charge will be deducted from any amount due and owing to the Contractor for General Construction Work.
- P. OVERTIME USE - ALL CONTRACTS. Whenever any Contractor(s) work before or after the regular work hours as indicated in Subparagraph B above, or on a Saturday, Sunday or Holiday, such Contractor or Contractors shall pay the Contractor for General Construction Work for the operation and maintenance of the temporary elevator, if required by such Contractor or Contractors, at the rate indicated in the Item of the bid form of the General Construction Work Contract but increased to reflect the difference between regular wage rates and overtime wage rates. The basic hourly charge shall be considered as one ninth (1/9) of the amount shown in the item of the General Construction Work Contract. The City will not pay any Contractor for such overtime use of the elevator. When more than one (1) Contractor is involved in the overtime work, the charges shall be prorated as determined by the Resident Engineer unless otherwise agreed mutually among all the Contractors involved.

PART C - EXISTING BUILDINGS (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

- A. The Contractor for General Construction Work may use, at the Commissioner's discretion, one (1) selected elevator in the project for temporary operation by the General Construction Work Contractor for the transportation of employees of all Contractors and representatives of the Department of Design and Construction and other Governmental Agencies having jurisdiction over work at the Project. The Contractor for General Construction Work shall maintain for such elevators, all necessary hoisting ropes, governor cables, traveling conductor cables, operating devices hand reset target annunciators, signal devices, and all other permanent or temporary parts. The installation and maintenance of the temporary elevator and all equipment and/or parts utilized in connection therewith shall be in accordance with the rules and regulations of all agencies and/or entities having jurisdiction over elevators in temporary use.
- B. The Contractor for General Construction shall be responsible for any injury to persons or damage to property arising out of the temporary elevator and all equipment and/or parts utilized in connection therewith. The Contractor for General Construction shall employ and pay wages, including overtime wages if necessary, for all workers required for the operation and maintenance of the temporary elevator. The Contractor for General Construction shall be responsible for all costs for: (1) the installation of the temporary elevator, (2) maintaining the temporary elevator in clean, proper operating condition, including the cost of lubricants and/or parts for such maintenance, (3) all work in pits, shaftways and machine rooms necessary for the operation of the elevator, and (4) the replacement of

the temporary elevator or parts utilized in connection therewith, if required.

- C. The Contractor for General Construction Work shall keep the temporary elevator activated from a period of time of 15 minutes before the established starting time of that trade which starts work earliest in the morning to 15 minutes after the established quitting time of that trade which stops work latest in the evening. This applies to every day in the week, which is established as a regular working day for the aforementioned trades.
- D. The Contractor for General Construction Work shall replace with new any of the equipment or parts of the elevator for temporary operation installation that were damaged, destroyed, or that indicate excessive wear or corrosion excepting the replacement of hoisting ropes. All shaftways, pits, motor rooms and sheave spaces used for temporary operation of elevators shall be thoroughly cleaned down. Where lubricated rails are used they shall be washed down, if roller guides are used, all rust, dirt, etc., must be moved from the rails. The full cost of parts replacement, cleaning, etc., shall be borne by the Contractor for General Construction Work except for the replacement of hoisting ropes.
- E. The elevator for temporary operations shall be used during its operation for hoisting of materials or removal of rubbish, but shall be limited only to the transportation of employees of all Contractors and the representative of City Departments and other Governmental Agencies having jurisdiction of work at the project. However, the Resident Engineer may grant special permission at specified times to the various Contractors to hoist materials which, in the Resident Engineer's opinion, will not overload or damage the elevator installation. The particular Contractor using the elevator for the hoisting of its material shall be responsible for any damage to the elevator during the entire period of such use. The Contractor for General Construction Work shall give notification in writing to the Resident Engineer of any alleged employed for the hoisting of materials by the particular Contractor(s).
- F. The Contractor for General Construction Work shall pay all costs for the operation and maintenance of the elevator for temporary operation. All other costs in connection with the elevator and equipment excepting electrical work done by the Contractor for Electrical Work under its Contract, shall be included in the Contractor for General Construction Work's Contract.
- G. **LIQUIDATED DAMAGES** - The Contractor for General Construction Work will be charged at the rate of \$100 per day for each day it fails to provide elevator services described in this section beginning with 15 consecutive calendar days from notice to proceed. This charge will be deducted from any amount due and owing to the Contractor for General Construction Work.
- H. **OVERTIME USE - ALL CONTRACTS** - Whenever any Contractor(s) work before or after the regular work hours as indicated in Paragraph B above, or on a Saturday, Sunday or Holiday, such Contractor(s) shall pay the Contractor for General Construction Work for the operation and maintenance of the elevator, if required by such Contractor(s) at the union daily rates but increased to reflect the difference between regular wage rates and overtime wage rates. The City will not pay any Contractor for overtime use of the elevator. When more than one (1) Contractor is involved in the overtime work, the charges shall be prorated as determined by the Resident Engineer unless otherwise agreed mutually among all the Contractors involved.

1.36 General Mechanical Requirements (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

- A. The General Mechanical Requirements contained herein shall be followed by all Contractors furnishing mechanical equipment under their respective Contracts.
- B. **CONCEALED PIPING** - and ducts shall mean piping and ducts hidden from sight in masonry or other construction, in floor fill, trenches, partitions, hung ceilings, furred spaces, pipe shafts and in service tunnels not used for passage. Where piping and ducts run in areas that have hung ceilings, such piping and ducts shall be installed in the hung ceilings.
- C. **THE CONTRACT DRAWINGS** - are in part diagrammatic and show the general arrangement of the equipment, ducts and piping included in the Contract and the approximate size and location of the

equipment. The Contractor shall follow these Contract Drawings in laying out the work and shall consult the Contract Drawings of the other Contracts to become familiar with all conditions affecting it and to verify the spaces in which it will be installed. The Contractor shall cooperate with the Public Utilities doing certain necessary work for this project. The attention of the Contractor is called to the Contract Drawings for General Construction Work for the location, arrangement and extent of plumbing and other fixtures and equipment. All work shall be installed in locations as shown on these Contract Drawings.

- D. **CERTIFICATES** - On completion of the work, the Contractor shall obtain certificates of inspection, approval, acceptance and of compliance with all laws from all agencies and/or entities having jurisdiction over the work and shall deliver these certificates to the Commissioner. The work shall not be deemed substantially complete until the certificates have been delivered.
- E. **SHOP DRAWING SUBMITTALS** - Contractors doing mechanical work shall submit, as directed, Shop Drawings, roughing drawings, manufacturer's Shop Drawings, field drawings, cuts, bulletins, etc., of all materials, equipment and methods of installation shown or specified.
1. Submit sheet metal shop standards. Submit manufacturer's product data including gauges, materials, types of joints, scaling materials and installations for metal ductwork materials and products.
 2. Submit scaled layout drawing (3/8"=1') of metal ductwork and fittings including, but not limited to, duct sizes, locations, elevations, slopes of horizontal runs, wall and floor penetrations and connections. Show modifications of indicated requirements made to conform to local shop practice and how those modifications ensure that free area, materials and rigidity are not reduced. Layouts should include all the room plans, mechanical equipment rooms and penthouses. Method of attachment of duct hangers to building construction all with the support details. Coordinate shop drawings with related trades prior to submission.
 3. Indicate duct fittings, particulars such as gauges, sizes, welds and configuration prior to start of work for low-pressure systems.
 4. Submit maintenance data and parts lists for metal ductwork materials and products. Include this data, product data and shop drawings in maintenance manual.
- F. **ACCESSIBILITY** - All work shall be installed by the Contractor so as to be readily accessible for inspection, operation, maintenance and repair. Minor deviations from the arrangement indicated on the Contract Drawings may be made to accomplish this, but they shall not be made without approval by the Commissioner.
- G. **CHANGES IN PIPING, DUCTS, AND EQUIPMENT** - Wherever field conditions are such that for proper execution of the work, reasonable changes in location of piping, ducts and equipment are necessary and required, the Contractor shall make such changes as directed and approved, without extra cost to the City.
- H. **CLEANING OF PIPING, DUCTS, AND EQUIPMENT** - Piping, ducts and equipment shall be thoroughly cleaned by the Contractor of all dirt, cuttings and other foreign substances. Should any pipe, duct or other part of the several systems be obstructed by any foreign matter, the Contractor will be required to pay for disconnecting, cleaning and reconnecting wherever necessary for the purpose of locating and removing obstructions. The Contractor shall pay for repairs to other work damaged in the course of removing obstructions.
- I. **STANDARDIZATION OF SIMILAR EQUIPMENT** - Unless otherwise particularly specified, all equipment of the same kind, type or classification, and used for identical purposes, shall be the product of one (1) manufacturer.
- J. **MACHINERY PARTS** - shall conform exactly to the dimensions shown on the Contract Drawings. The equivalent parts of identical machines shall be identical so that they can be interchangeable.

- K. **FITTINGS** - All grease lubricating fittings on equipment shall be of a uniform type and shall be readily accessible and types proposed to be used shall be submitted for approval.
- L. **GUARDS** - All machinery shall be designed with protecting guards conforming with the requirements of the Industrial Code of the New York State Department of Labor or OSHA, whichever is stricter.
- M. **LIMIT SWITCHES** - Unless otherwise specified, limit switches and other mechanically actuated switches shall be enclosed in tight metal boxes and be installed in the proper locations ready for conduit connections. Switches shall be complete with all supports, stops, cams, arms, tripping and operating members, which shall be adjustable where required for proper functioning.
- N. **ANCHORS, BOLTS, ETC. AND FOUNDATIONS** - Unless otherwise specified, the Contractor shall furnish the necessary anchors, bolts, guides, track rails, bearing plates, substantial templates and all other appurtenances, and build the necessary foundations, as approved by the Commissioner, for all equipment supplied by the Contractor under its Contract.
- O. **EQUIPMENT DESIGN** - Equipment and appurtenances shall be designed in conformity with ASME and AIEE standards and shall be of rugged construction and of sufficient strength to withstand all stresses which may occur during fabrication, testing, transportation, installation, and all conditions of operations. Adequate stays, braces and anchors shall be provided. All bearings and moving parts shall be adequately protected against wear by bushings, or other approved means, and shall be fully lubricated by readily accessible devices. Details shall be designed for appearance as well as utility. Protruding members, joints, corners, gear covers and the like shall be finished in appearance. All exposed welds shall be ground smooth and the corners of structural shapes shall be mitered.
- P. **SUPPORTING STRUCTURES DESIGNED BY THE CONTRACTOR** - Unless otherwise specified, supporting structures for equipment to be furnished by the Contractor shall be designed and built by the Contractor of sufficient strength to safely withstand all stresses to which they may be subjected, within permissible deflections, and shall meet the following standards:
1. Structural Steel - ASTM Standard Specifications, AISC and NYBC.
 2. Concrete for supports for equipment shall conform to the Specifications for concrete herein, but in no case shall be less than the requirements of the NYBC for average concrete.
 3. Steel reinforcement for concrete shall be of intermediate grade and shall meet the requirements of the Standard Specifications for Billet Steel-Concrete Reinforcement Bars, ASTM.
- Q. **ENGINEER'S ASSUMED DESIGN DATA** - All structural steel, concrete and reinforcement indicated or specified to support the equipment or appurtenances and the area immediately adjacent thereto have been designed from data based on assumed average anticipated clearances and loading. The final structural design in these locations will be based on definite data received from the Contractor after the Commissioner approves the equipment and appurtenances to be installed. The Commissioner will then redesign, if necessary, the supporting structure to properly support and maintain the approved equipment and appurtenances. Necessary major changes in design will be covered by Supplementary Drawings that will be furnished to the Contractor. All changes indicated or necessary to accommodate the equipment and appurtenances, shall be incorporated into the Working Drawings submitted for approval, and the cost of furnishing and installing the work necessitated by these changes shall be borne by the Contractor furnishing the equipment.
- R. **INSTALLATION OF EQUIPMENT** - Equipment shall be erected in a neat and workmanlike manner on the foundations, at the locations and elevations shown on the Contract Drawings or as required. All equipment shall be correctly aligned, leveled and adjusted for satisfactory operation and shall be installed so that proper and necessary connections can be made readily between various units and with piping and equipment that may be installed under other Contracts. When required by the Specifications, the Contractor shall obtain the assistance of a competent and experienced Engineer or Superintendent, in the employ of the manufacturer, to install the equipment.

S. **ELIMINATION OF NOISE** - All work provided under the Contract shall operate without objectionable noise or vibration.

1. Should operation of any one or more of the several systems produce noise or vibration which is, in the opinion of the Commissioner, objectionable, the Contractor shall at its own expense make changes in piping, equipment, etc. and do all work necessary to eliminate objectionable noise or vibration.
2. Should noise or vibration found objectionable by the Commissioner be transmitted by any pipe or portions of the structure from equipment installed under the Contract, the Contractor shall at its own expense install such insulators and make such changes in or additions to the installations as may be necessary to prevent transmission of this noise or vibration.

T. **GROUTING** - The Contractor shall furnish all material and labor for proper bedding on Portland Cement grout, the equipment or its supporting base. Grout shall consist of one (1) part Portland Cement and one (1) part of approved sand. The top of the masonry foundation shall be properly cleaned and wetted before grouting. Grout shall completely fill all spaces between the equipment, or base, and the foundation and it shall generally average one (1) inch in thickness. Leveling wedges shall not be removed before the grout has reached its final set. Voids left by wedges shall be pointed with grout. Exposed surfaces of the grout shall have a finished appearance.

U. **PRELIMINARY FIELD TEST** - As soon as conditions permit, the Contractor shall furnish all necessary labor and materials for, and shall make, preliminary field tests of the equipment to ascertain compliance with the requirements of the Contract. If the preliminary field tests disclose equipment that does not comply with the Contract, the Contractor shall, prior to the acceptance test, make all changes, adjustments and replacements required.

V. **INSTRUCTIONS ON OPERATION** - At the time the equipment is placed in permanent operation by the City, the Contractor shall make all adjustments and tests required by the Commissioner to prove that such equipment is in proper and satisfactory operating condition. The Contractor shall instruct the City's operating personnel on the proper maintenance and operation of the equipment for the period of time called for in the Specifications.

1.37 General Electrical Requirements

SCOPE - This Article sets forth the general requirements applicable to electrical work for the Project. Such requirements are intended to be read in conjunction with the Specifications and Contract Drawings for the Project. In the event of any conflict between the requirements set forth in this Article and the requirements of the Specifications and/or the Contract Drawings, whichever requirements is the most stringent, as determined by the Commissioner, shall take precedence.

PART A - PROCEDURE--ELECTRICAL APPROVALS

SCOPE- This Section sets forth general electrical information, as well as required approvals for all electrical work required for the Project, including ancillary electrical work which may be included in contracts for other than the Contract for Electrical Work.

- A. **ELECTRIC SERVICE** - The electric service supply is subject to commercial and operating variation of the utility company. Proper provision shall be made to have all apparatus operate normally under these conditions.
- B. **SUPERVISION AND ACCEPTANCE** - The electrical work and equipment shall be installed under the supervision of the Commissioner's representative. Final acceptance and approval of the work will be contingent upon the inspection and test of the installation by the City regulatory agency, on completion.
- C. **TESTS** - The Contractor shall notify the Commissioner when the Contractor will examine and begin

work and shall also notify the Commissioner when the Contractor has completed the work and is ready to have it inspected and tested. Upon completion of the work and prior to final payment, tests shall be made as required by the Commissioner of all electrical materials, electrical and associated mechanical equipment, and of appliances installed hereunder. The Contractor shall furnish all labor and material for such tests. Should the tests show that any of the material, appliances or workmanship are not first class or not in compliance with the Contract, the Contractor on written notice shall remove and promptly replace them with other materials in conformity with the Contract. -

- D. **CERTIFICATE OF THE BUREAU OF ELECTRICAL CONTROL, OF THE DEPARTMENT OF BUILDINGS (B.E.C.)** - Before final payment is made, there must be filed with the Department of Design and Construction, a Certificate of Inspection signed by the Director of the B.E.C., which Certificate shall certify that all materials and workmanship comply with the rules and regulations of the B.E.C. of the City of New York and with the Electrical Code of the Administrative Code of the City of New York.
- E. **RESPONSIBILITY FOR CARE AND PROTECTION OF EQUIPMENT**
1. The Contractor furnishing any equipment shall be responsible for the equipment until it has been finally inspected, tested and accepted, in accordance with the requirements of these Specifications.
 2. After delivery and before and after installation, the Contractor shall protect all equipment against theft, injury or damage from all causes. The Contractor shall carefully store all equipment received for work, which is not immediately installed. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through a special dielectric test as directed by the Commissioner, at the expense of the Contractor or replaced by the Contractor without additional cost to the City.
- F. **UNIFORMITY OF EQUIPMENT** - Any two (2) or more pieces of apparatus or materials of the same kind, type or classification and being used for identical types of service, shall be made by the same manufacturer.
- G. **CONTRACTOR'S ELECTRICAL DRAWINGS AND SAMPLES FOR APPROVAL**
1. The Contractor shall submit to the Commissioner for approval, complete dimensional drawings of all equipment, wiring diagrams, motor test data, details of control, installation layouts showing all details and locations and including all schedules, and descriptions and supplementary data to comprise complete working drawings and instructions for the performance of the work. A description of the operation of the equipment and controls shall be included. A letter, in triplicate, shall accompany each submittal.
 2. The Contractor shall submit duplicate samples of such materials and appliances as may be requested by the Commissioner for approval. These samples shall be properly tagged for identification and submitted for examination and test. After the samples are approved, one (1) sample will be returned to the Contractor and the other sample will be filed in the office of the Commissioner's representative for inspection use. After the Contract is completed, the second set of samples will be returned to the Contractor.
- H. **TIMELINESS** - All material shall be submitted in sufficient time for the program of construction. Failure to promptly submit acceptable samples and dimensional drawings of equipment will not be accepted as grounds for an extension of time. The Commissioner may decline to consider submittals unless all related items are submitted at the same time.
- I. **CONTRACTOR'S STATEMENT WITH SUBMITTALS** - All dimensional drawings of equipment, blueprints, catalogues, models, samples and other data relative to the equipment, the materials, the work or any part thereof submitted for approval are to be accompanied by a statement that they have been examined by the Contractor and that the drawings, data and other material submitted agree with the requirements of the Contract and Specifications and shall list and describe the points of

disagreements, if any exist. In the absence of such statement, approvals will be given with the understanding that articles of equipment or materials or methods of installation are in substantial compliance with the Contract and that if the adoption of these designs, details, articles, equipment, materials, constructions, installations, places and locations necessitate changes, alterations or replacements at an increased cost to the Contractor or others, the Contractor making the substitution for the specified equipment or material shall bear all such additional expense involved.

- J. **BULLETINS AND INSTRUCTIONS** - The Contractor shall furnish and deliver to the Commissioner, after acceptance of the work, four (4) complete sets of instructions, technical bulletins and any other printed matter (diagrams, prints, or drawings) required to provide complete information for the proper operation, maintenance and repair of the equipment and the ordering of spare parts.

PART B - TEMPORARY LIGHTING, SITE SECURITY LIGHTING & POWER

SCOPE - This Section sets forth the General Conditions and procedures relating to Temporary Lighting, Site Security Lighting and Power during the construction period, and is applicable to, and binding on, all Contracts insofar as they are affected.

A. **TEMPORARY LIGHTING (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)**

1. Energy for the Temporary Lighting System for minor rehabilitation projects (those projects whose existing distribution system is not being changed or modified under the scope of this project) may be taken from the existing electrical distribution system if the existing system is of adequate capacity for the additional temporary lighting load. The Contractor for Electrical Work is to cooperate and coordinate with the facility custodian so as not to interfere with the normal operation of the facility.
2. Energy for the Temporary Lighting system for new projects and for those existing projects that are not covered in the preceding paragraph shall be provided as in the following paragraphs.
3. **CONNECTION TO UTILITY LINES** - Temporary Electric Service for use during construction shall be provided as follows: The Contractor for Electrical Work shall provide adequate service for the temporary lighting system, or a minimum of 100 Amperes, 3-phase, 4-wire service for the temporary lighting system, whichever is greater, and make all necessary arrangements with the Public Utility Company and pay all charges by them for the Temporary Lighting system. The Contractor for Electrical Work shall include in its bid any charges which may be made by the Public Utility Company for extending its electrical facilities, and for making final connections. The Contractor for Electrical Work shall make payment directly to the Public Utility Company.
4. **APPLICATIONS FOR METER** - The Contractor for Electrical Work shall make application to the Public Utility Company and sign all documents necessary for, and pay all charges incidental to, the installation of a watt hour meter or meters for Temporary Lighting. The Contractor for Electrical Work shall pay to the Public Utility Company, all bills for Temporary Lighting energy used throughout the work, as they become due.
5. **SERVICE AND METERING EQUIPMENT** - The Contractor for Electrical Work shall furnish and install, at a suitable location on the site, approved service and metering equipment for the Temporary Lighting System, ready for the installation of the Public Utility Company's metering devices. The temporary service mains to and from the metering location shall be not less than 100 Amperes, 3-phase, 4-wire and shall be of sufficient capacity to take care of all demands for Temporary Lighting and Site Security Lighting and shall meet all requirements of the NYCEC.
6. The Contractor for Electrical Work shall furnish and connect to the metered service point, a system of Temporary Lighting to illuminate the entire area where work is being performed and points adjacent to the work, with separately fused circuits for stairways and bridges. Control switches for stairway circuits shall be located near entrance on ground floor.

7. ITEMS - The Temporary Lighting System shall consist of wiring, fixtures, left-hand double sockets, (one (1) double socket for every 400 square feet, with one (1) lamp and one (1) three-prong outlet) lamps, fuses, locked type guards, trailers and any other incidental material. Additional details may be outlined in the detailed Specifications for the Electrical Work. Changes may be made, provided the full equivalent of those requirements is maintained.
8. The Temporary Lighting System shall be progressively installed as required for the advancement of the work under the various Contracts.
9. RELOCATION - Any Contractor requiring the relocation or extension of the original Temporary Lighting System that is not required due to the normal advancement of the work, as determined by the Commissioner's field representative, shall bear all costs thereof.
10. TRAILERS - Trailers shall be furnished with left-hand sockets with locked type guards and 40 feet of rubber covered cable. The Contractor for Electrical Work shall furnish and distribute a minimum of three (3) complete trailers to each Contractor. See the detailed Electrical Specifications for possible additional trailers required.
11. LAMPS - The Contractor for Electrical Work shall furnish and install one (1) complete set of lamps, including those for the trailers. Broken and burned out lamps in the general lighting system shall be replaced by the Contractor for Electrical Work while those in the trailers shall be replaced by the Contractor using such equipment. All lamps shall be 100 watt.
12. CIRCUIT PROTECTION - The Contractor for Electrical Work shall furnish and install GFI protection for the Temporary Lighting and Site Security Systems.
13. ENERGIZING - The Contractor for Electrical Work shall keep the Temporary Lighting System energized from a period of time, 15 minutes before the established starting time of that trade, which starts work earliest in the morning to 15 minutes after the established quitting time of that trade which stops work latest in the evening. This applies to every day in the week which is established as a regular working day for any trade involved in the construction of this facility and holds until completion and final acceptance of the work of the Contractor for Electrical Work or until the services are terminated by instructions from the Commissioner.
14. MAINTENANCE OF TEMPORARY LIGHTS
 - a. The Contractor for Electrical Work shall maintain the Temporary Lighting System in good working order during the scheduled hours established.
 - b. The Contractor for Electrical Work is to include in its contract all charges for energy for the Temporary Lighting System.
 - c. The Contractor is advised to show the estimated cost of the installation, maintenance and energy of temporary electrical facilities in its detailed cost estimate of its Contract so as to facilitate partial payments during construction.
15. OVERTIME USE - Any Contractor requiring Temporary Lighting Service before or after hours set forth hereinbefore, or on weekends or a Holiday for all trades involved in the construction of this facility, shall pay for the additional cost of keeping the system energized and repaired. If more than one (1) Contractor is involved, the charges shall be prorated, or shared by other acceptable means previously agreed upon by the Contractors involved. When overtime is required by all Contractors on the work, the provisions for payment for regular time use of the Temporary Lighting System shall apply.
16. SERVICE BEYOND COMPLETION DATE - When failure to comply with the terms and conditions of any Contract necessitates temporary light beyond the date set for completion of the Contract for Electrical Work, the Contractor requiring such additional service shall pay for keeping it energized. When more than one (1) Contractor requires such service, the expense thereof shall be prorated

as determined by the Commissioner.

17. **ADJUSTMENT IN CONTRACT PRICE FOR TEMPORARY LIGHTING MAINTENANCE** - In the event that the temporary lighting maintenance extends beyond the Contract time through no fault of the Contractor for Electrical Work, the additional maintenance cost will be in accordance with the requirements of the following paragraphs:
 - a. Payment for maintaining Temporary facilities when required will be made at the average hourly wage for electricians plus 69% of this rate, for each hour of work done upon order of the Resident Engineer. Payments will be included in partial estimates upon submission of detailed vouchers stating date, hour and time expended for each item of work.
 - b. The addition of 69% of the average hourly wage rate specified above shall be deemed as the total allowance for all profit and overhead and for any and all other costs and expenses of any nature whatsoever, including but not limited to allowance for insurance, workman's compensation, unemployment insurance and other supplementary benefits.
18. **REMOVAL OF TEMPORARY LIGHTING WIRING** - The temporary lighting system shall be removed by the Contractor for Electrical Work when authorized by the Commissioner.
19. **HAND TOOLS** - The temporary electric lighting system shall not be used for power purposes, excepting that light hand tools not larger than 1/4 horsepower may be operated therefrom by any Contractor.

B. SITE SECURITY LIGHTING (FOR NEW CONSTRUCTION ONLY) (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

1. The Contractor for the Electric Work shall furnish, install and maintain a system of site security lighting, as herein specified, to illuminate the construction site of the project, and it shall be connected to and energized from the Temporary Lighting System.
2. It is essential that the site security lighting system be completely installed and operating, at the earliest possible date. All Contractors must cooperate, coordinate and exert every effort to accomplish an early complete installation of the site security lighting system. After the system is installed and in operation, and a part of the system interferes with the work of any trade, that trade shall be completely responsible for the expense of removing, relocating and replacing all equipment necessary to reinstate the system to proper operating conditions.
3. The system shall consist of flood lighting by pole mounted guarded sealed-beam units. Floodlight units shall be mounted 16 feet above grade. Floodlights shall be spaced around the perimeter of the site to produce an illumination level of no less than one (1) foot candle around the perimeter of the site, as well as in any potentially hazardous area or any other area within the site that might be deemed by the Resident Engineer to require security illumination. The system shall be installed in a manner acceptable to the Resident Engineer. The first lighting unit in each circuit shall be provided with a photoelectric cell for automatic control. The photoelectric cell shall be installed as per manufacturer's recommendations.
4. All necessary poles shall be furnished and installed by the Contractor for Electrical Work.
5. The site security system shall be kept illuminated at all times during the hours of darkness. The Contractor for Electrical Work, at its own expense, shall keep the system in operation, furnishing and installing all material necessary to replace all damaged or burned out parts.
6. The Contractor for Electrical Work shall be on telephone call alert for maintaining the system during the operating period stated above.
7. All materials and equipment furnished under this section shall remain the property of the Contractor for Electrical Work and shall be removed and disposed of by the Contractor for

Electrical Work upon completion of that phase of the project.

C. TEMPORARY POWER

1. Any Contractor requiring temporary power for equipment larger than 1/4 horsepower shall arrange with the Public Utility for service and pay for all electrical energy consumed by its lines.
2. The Contractor shall provide service, metering equipment and distribution centers as required, and be responsible for keeping the system in working order.
3. When directed by the Commissioner, the Contractor shall remove its own temporary power system.

D. USE OF COMPLETED PORTIONS OF THE ELECTRICAL WORK

1. **USE OF MAIN DISTRIBUTION PANEL** - As soon as the permanent electric service feeders and equipment, metering equipment and main distribution panel are installed and ready for operation, the Contractor for Electrical Work shall have the temporary lighting system changed over from the temporary service points to the main distribution panel.
2. **COST OF CHANGE OVER** - The Contractor for Electrical Work shall be responsible for all cost due to this change over of service and it shall also make application to the Public Utility Company for a watt hour meter to be set on the permanent meter equipment.
3. The requirements for temporary lighting specified herein shall be adhered to after change over of service.
4. **NO EXTRA COST** - The operation of the service and switchboard equipment shall be under the supervision of the Contractor for Electrical Work, but this shall in no way be interpreted to mean the acceptance of such part of the installation or relieve the Contractor from its responsibility for the complete work or any part thereof. There shall be no additional charge for supervision by the Contractor for Electrical Work.

PART C - ELECTRICAL INSTALLATION PROCEDURE

SCOPE - This Section sets forth the general installation procedure that shall apply to all electrical work and electrical equipment appearing in any of the Contracts.

- A. INTENT OF CONTRACT DOCUMENTS** - Contract Specifications and Contract Drawings are to be interpreted as a means of conveying the scope and intent of the work without giving every minor electrical detail. It is intended, nevertheless, that each Contractor shall provide whatever labor and materials are found necessary, within the scope of its Contract, for the successful operation of the installation. Specific details of individual installations are to be finally decided upon when the Contractor submits Working or Shop Drawings for approval to the Department of Design and Construction. Whenever there are two (2) or more methods to complete project work within the Contract scope, the Commissioner reserves the right to choose that method which, in the Commissioner's opinion, will afford the most satisfactory performance, lasting qualities, and accessibility for repairs, even though this selection is the most costly.
- B. SCHEMATIC PLANS - APPROXIMATE LOCATIONS** - Conduits and wiring are shown on the plans for diagrammatic purposes only. Therefore, conduit layouts may not necessarily give the actual physical route of the conduits. The Contractor who installs a conduit system will also be required, as part of the work, to furnish and install all hangers and pull-boxes, including any special pull-boxes found necessary to overcome interferences, and to facilitate the pulling of electrical cables. Similarly, the locations of equipment, appliances, outlets and other items shown on Contract Drawings are only approximate and are to be definitively established when equipment Shop Drawings are submitted and approved by the Department of Design and Construction during construction.

- C. **SLEEVES** - required for conduits passing through walls or floors, shall be furnished and set by the Contractor installing the conduits. Sleeves in waterproofed floors shall be provided with flashing extending 12 inches in all directions from sleeve and secured to waterproofing. Flashing shall be turned down into space between pipe and sleeve and caulked watertight. Flashing shall be 20 oz. cold rolled copper. Sleeves shall be supplied with welded flanges similar to those supplied by the Contractor for Plumbing Work and shall extend one (1) inch above finished floor.
- D. **COORDINATION** - Each Contractor shall keep in close touch with the construction progress and obtain the necessary information for the accurate placement of its work in ample time before project construction operations obstruct its work. Each Contractor is to consult all other Contract Drawings, as well as approved equipment Shop Drawings on file in the Resident Engineer's Field Office. This will aid in avoiding interferences, omissions and errors in the electrical installation.
- E. **RESPONSIBILITY FOR ERRORS OF INSTALLATION** - In case of interference with the work of others or erroneous placement of work with respect to equipment or structures, each Contractor shall cooperate with other affected Contractors for an immediate agreeable solution of the affected work with each Contractor furnishing its responsible share of the labor and materials necessary to complete the installation in an approved manner.
- F. **RESTORATION** - If drilling or cutting is done on finished surfaces of equipment or the structure, any marring of the surface shall be repaired or replaced by the Contractor who caused the damage. Each Contractor shall be held responsible for corrective restoration due to its cutting or drilling, and for any damage to the project or its contents caused by the Contractor or the Contractor's workers. Any Contractor who pierces waterproofing because of the installation of their work shall, at their own expense, restore the waterproofing to the satisfaction of the Commissioner.
- G. **ELECTRICAL WORK AT SITE** - Any Contractor who is required to furnish equipment consisting of a number of related electrical devices or appliances, mounted in a single enclosure, or on a common base, shall furnish this unit complete with internal wiring, connections, terminal boxes with copper connectors and/or lugs and ample electrical leads, ready for connection and operation. The cost of any wiring, re-wiring or other work required to be done on this unit in the field, shall be borne by the Contractor who furnished the unit, without cost to the City.
- H. **COOPERATION AMONG CONTRACTORS** - Whenever an electrically operated unit or system involves the combined work of several Contractors for its installation and successful operation, each Contractor shall exercise the utmost diligence in cooperating with others to produce a complete, harmonious installation.
- I. **DEFINITIONS**
1. **WIRING** means both wire and raceway (rigid steel, heavy wall conduit unless specifically indicated otherwise).
 2. **POWER WIRING** means wiring from a panelboard or other specified source to a starter (if required) then to a disconnect (if required) then to the final point of usage such as a motor, unit or device.
 3. **CONTROL and/or INTERLOCK WIRING** means that wiring that signals the device to operate or shut down in response to a signal from a remote control device such as a temperature, smoke, pressure, float, etc. device (starters and disconnect switches are not included in this definition) regardless of the voltage required for the controlling device.
- J. **WORK BY CONTRACTORS FURNISHING ELECTRICAL EQUIPMENT** - Any Contractor who furnishes an electrically operated or motorized unit of equipment shall install same and, as part of its Contract, perform the following work in connection therewith:
1. **FOUNDATIONS** - Unless otherwise specified or indicated, the Contractor furnishing electrically operated equipment shall also furnish and install approved foundations for same. Special

foundations, if required, will be described in the detailed Specification.

- a. **MATERIAL** - All foundations, unless required otherwise, shall rest on a structural slab and shall be of poured concrete, of a mixture specified for reinforced concrete. Foundations shall present a neat, smooth appearance without voids, sharp corners or edges.
 - b. **DIMENSIONS** - Foundation dimensions, height above floor, methods of setting, aligning and anchoring of equipment shall be as recommended by the manufacturer of equipment and approved by the Commissioner. The minimum height of foundations above finished floor shall be four (4) inches and foundations shall extend at least six (6) inches at all sides beyond the base plates of equipment.
2. At least one (1) inch of grout shall be applied under the equipment base plate after placement and alignment of the equipment.
 3. **ITEMS** - Anchor plates, bolts, sleeves, nuts and washers and other necessary items for proper installation of equipment shall be provided. The Contractor shall also furnish and set required templates to locate accurately the positions of the hold-down bolts.
 4. **VIBRATION ISOLATION** - If specifically required in the detailed Specifications for a particular unit, vibration isolators shall be provided for rotating equipment.
 5. **SUPPORTS** - If any motorized equipment is required to be mounted overhead or off a wall, the Contractor supplying the unit shall furnish and install a suitable platform, bracket or shelf, whichever is appropriate or specified, and mount the equipment thereon. This support shall be constructed of substantial steel members, plates, etc., and the whole securely fastened to the structure or to anchors previously embedded in the wall or slab. In case of excessive vibration transmitted to structure, isolating pads or other devices shall be installed. The Contractor shall apply one (1) coat of approved primer paint to the support and one (1) additional coat of approved paint in the field.
 6. **ASSOCIATED EQUIPMENT** - The Contractor who furnishes a motorized or electrically operated unit of equipment shall also furnish all associated motor starters, disconnect means, relays, control devices, lamps, or other devices, necessary for the successful functioning of the unit.
 7. **POINT OF DELIVERY** - Any item specified to be installed by the Contractor for Electrical Work and delivered to the site that can not be hand carried (due to bulk, weight or timeliness) to the location of its installation is to be delivered and set in place, leveled and secured by the Contractor furnishing the equipment. Such delivery shall be to the location where it is to be installed by the Contractor for Electrical Work.
 8. **CONTROL AND INTERLOCK WIRING**
 - a. **General Construction Work and Plumbing Work.**
 - (1) All control wiring associated with doors and door hardware is to be furnished and installed, unless otherwise indicated, by the Contractor furnishing the doors. Power for the door operation and for its controls shall be furnished and installed by the Contractor for Electrical Work.
 - (2) All other control wiring associated with equipment furnished by either the Contractor for General Construction Work or the Contractor for Plumbing Work is to be furnished and installed by the Contractor for Electrical Work.
 - b. **Contractor for Heating, Ventilating and Air Conditioning Work**
 - (1) The furnishing and installing of all control devices and all control and interlock wiring for equipment furnished under the Heating, Ventilating and Air Conditioning Contract shall be

by that Contractor, including any power required for any control device.

- (2) The Contractor for Heating, Ventilating and Air Conditioning Work shall deliver to the Contractor for Electrical Work all starters and disconnect switches specified to be furnished under the Heating, Ventilating and Air Conditioning Contract. The Contractor for Electrical Work is to install the starters and disconnect switches, and furnish and install all power wiring and make connections between the starter, disconnect switch and motor or equipment being served. The motor or equipment is to be mounted by the Contractor furnishing the motor.

9. **INSTALLATION OF BURNER** - The Contractor who furnishes and installs the gas/oil-fired boiler/furnace shall also include as part of its Contract, the work of furnishing, installing and connecting all equipment, controls with necessary conduits and wiring, to a service point provided by the Contractor for Electrical Work. Unless detailed otherwise in the Specific Requirements, the Contractor for Electrical Work shall furnish power from the power source to a junction box furnished and installed by the Contractor for the Electrical Work and located near the boiler/furnace control panel. The Contractor for Electrical Work shall also furnish and install an empty conduit and a junction box to be located at a remote location (outside of the boiler/furnace room) for an emergency shut-off switch. The shut-off switch and all other conduit and wire shall be furnished and installed by the Contractor furnishing the boiler/furnace.

K. **WORK BY CONTRACTOR FOR ELECTRICAL WORK** - The Contractor for Electrical Work shall perform the following work:

1. **PANELETTE** - The Contractor for Electrical Work shall furnish and install a four (4) circuit panelette in each mechanical equipment room.
2. **STARTERS AND DISCONNECT SWITCHES** - The associated disconnect switches and starters approved by the Department of Design and Construction which require mounting or wiring apart from a main equipment unit shall be delivered, prewired, to the Contractor for Electrical Work at the site of the project, who shall install and wire them. The electrical Contractor shall acknowledge acceptance in writing to the Contractor supplying them, and thereafter assume responsibility for their safe-keeping until final acceptance of its work by the City.
3. **CONTROL DEVICES** - The Contractor for Electrical Work shall install conduit, wire, and make all connections for all interlock and control devices furnished under the Plumbing Work Contract and also all control and interlock devices furnished under the General Construction Work Contract, except for door control wiring. The various control and interlock devices, furnished (prewired) by the Contractors for Plumbing and General Construction Work Contractors, shall be installed and final connections made by the Contractor for Electrical Work.
4. **DOOR CONTROL WIRING** - Unless specifically detailed otherwise in the Contract Documents for Electrical Work, all door control and interlock devices are to be furnished and installed and wired by the Contractor furnishing the required control and interlock devices.
5. **TESTS** - The Contractor supplying the equipment, together with the Contractor for Electrical Work shall cooperate in making preliminary tests to establish the correctness of the installation. If a faulty operation of the unit is discovered, the Contractor whose work is the cause shall, without delay, remedy the trouble.

L. **PAINTING**

1. Ingredients and methods of application shall conform to that as required for similar work under the Contract for General Construction Work.
2. **ALL METAL CABINETS** - including switchboards, panelboards, boxes (pull, junction and outlet), trims, doors and covers shall be painted as follows:

All surfaces inside and outside, one (1) approved coat of primer. All accessible surfaces one (1) coat of approved paint inside and outside, in the field after installation.

3. **HANGERS, CONDUITS AND FITTINGS** – The Contractor who installs them shall give one (1) field applied, approved coat primer, followed by a second coat.
4. **FINAL COAT**--A final or third coat of paint, as directed, shall be applied by the Contractor installing them when the wall surfaces on which they are supported or the ceiling from which they are hung are not painted by the Contractor for General Construction Work. Pull boxes shall be neatly and legibly stenciled to show service.
5. **PAINTING OF MOTORIZED EQUIPMENT** - The Contractor furnishing electrically driven equipment shall paint motors and driven equipment, starters and controllers and other equipment provided by the Contractor. The Contractor shall provide any painting or finishing that may be required in the Specifications. For certain equipment having special corrosion resistant factory finishes, painting may be waived by special permission. Equipment shall be neatly stenciled, with legible characters to indicate service by the Contractor who supplies the equipment.
6. **NAME PLATES** - shall be left clean of all paint.

PART D - ELECTRICAL CONDUIT SYSTEM INCLUDING BOXES (PULL, JUNCTION AND OUTLET) - (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

SCOPE - This Section sets forth the requirements applying to any Contract requiring the installation of electrical conduits, boxes or fittings. Rigid steel conduit shall be used through out, unless specifically indicated otherwise. TYPES-where the word 'conduit', without a modifier such as, rigid steel, EMT, etc., is specified to be used, it shall be interpreted to mean, rigid steel, heavy wall, threaded conduit.

A. CONDUIT TYPES

1. **RIGID STEEL CONDUIT** - shall be interpreted to mean rigid steel, heavy wall conduit that is hot dipped galvanized inside and outside. The conduit shall meet the requirements of the latest edition, as amended, of the "Standard for Rigid Steel Conduit" of the Underwriters' Laboratories, Inc. Unless otherwise specified in the Specifications or indicated on the Contract Drawings, rigid steel conduit shall be used for all exposed work, for all underground conduits in contact with earth and for fire alarm systems as required by the Building Code. Rigid steel conduit shall be used for all underground conduits in contact with earth, for Fire Alarm Systems and as required by authorities having jurisdiction.
2. **ELECTRICAL METALLIC TUBING (EMT)** - shall be industry standard thin wall conduit of galvanized steel only. All elbows, bends, couplings and similar fittings which constitute a part of the conduit system shall be specifically designed for use with electric metallic tubing. Couplings and terminating fittings shall be of the pressure type as approved by the Commissioner. Set screw fittings will not be acceptable. EMT shall meet the requirements of the latest edition, as amended, of the "Standard for Electrical Metallic Tubing of the Underwriters Laboratories Inc." EMT may only be used where specifically indicated. In no case will EMT be permitted in spaces other than hung ceilings and dry wall partitions.
3. **FLEXIBLE METALLIC** - For final connections to motors and motorized equipment, not more than a 4' - 0" length of flexible conduit may be used; for watertight installations, this conduit shall be of a watertight type, attached with watertight glands or fittings, for final connections from outlet box to recessed lighting fixtures and in locations only where specifically permitted by the Specifications or Contract Drawings.

B. INSTALLATIONS AND APPLICATIONS

1. Unless otherwise specified or indicated on the Contract Drawings, conduit runs shall be installed

concealed in finished spaces.

2. **CONDUIT SIZES** - The sizes of conduit shall be as indicated on the Contract Drawings. Wherever conduit sizes are not indicated, the conduit shall meet the requirements of the NYCEC to accommodate the conductors to be installed therein.
3. Conduits shall be reamed smooth after cutting. No running threads will be permitted. Universal type couplings shall be used where required. Conduit joints shall be screwed up to butt. Empty conduits after installation shall have all open ends temporarily plugged to prevent the entrance of water or other foreign matter.
4. Conduits being installed in concrete or masonry shall be securely held in place by the Contractor installing them during pouring and construction operations. A group of conduits terminating together shall be held in place by a template.
5. **UNDERGROUND STEEL CONDUITS** - Unless otherwise specified, all underground steel conduits in contact with earth shall be encased by the Contractor who installs them, in a covering of not less than two (2) inches of an approved concrete mixture. Concrete mix shall be one (1) part cement to four and one-half (4 ½) parts of fine and coarse aggregate.
6. **EXCAVATION RESTORATION PERMITS** - The Contractor installing underground conduits, duct banks or manholes shall perform, as part of its Contract, the work of cutting pavement, excavation shoring, keeping trenches or holes pumped dry, backfilling, restoration of surfaces to original condition and removal of excess earth and rubbish from premises. During the work, the Contractor shall provide adequate crossovers, protective barriers, lamps, flags, etc., to safeguard traffic and the public. When the work is in a public highway or street, the Contractor shall secure and pay for all necessary permits and inspection fees and pay the cost of repaving.
7. **EXPOSED CONDUIT SUPPORTS** - Exposed conduit shall be supported by zinc coated hangers with necessary inserts, beam clamps of approved design or attached to walls or ceilings by expansion bolts. Exposed conduits shall be supported or fastened at intervals not more than five (5) feet.
8. Exposed conduit shall be installed parallel or at right angles to ceiling, walls and partitions. Where direction changes of exposed conduit cannot be made with neat bends, such as required around beams or columns, conduit type fitting shall be used.
9. The conduit shall be installed with an approved expansion joint:
 - a. Wherever the conduit crosses a building expansion joint (each Contractor will be held responsible for determining where the building expansion joints are located).
 - b. Every 200 feet, when in straight runs of 200 feet or longer.
10. Conduit may only enter and leave a floating slab in the vertical direction, and then only in an approved manner. Horizontal entries into floating slabs are not permitted.
11. Conduit installed in pipe shafts shall be properly supported to carry the total weight of the raceway system complete with cable. In addition at least one (1) horizontal brace per 10 ft. section shall be provided to assure stability of the raceway system.
12. **BUSHINGS AND LOCKNUTS** - Approved bushings and locknuts shall be used wherever conduits enter outlet boxes, switch boxes, pull boxes, panel board cabinets, etc. For conduits one (1) inch in diameter or larger, insulating bushings to be O.Z. or approved equal.
13. **CONDUIT BENDS** - shall be made without kinking conduit or appreciably reducing the internal diameter. All bends in conduit of two (2) inch in diameter or larger shall be made with an hydraulic or power pipe bender. The radius of the inner edge of any bend shall not be less than six (6)

times the internal diameter of the conduit where rubber covered conductors are to be installed. And not less than 10 times the internal diameter of the conduit where lead covered conductors are to be used. Long gradual sweeps will be required, rather than sharp bends, when changes of direction are necessary.

14. EMPTY CONDUITS

- a. TESTS - All conduits and ducts required to be installed and left empty shall be tested for clear bore and correct installation by the Contractor who installed them using a ball mandrel and a brush and snake before the installation will be accepted. The ball shall be of lignum vitae turned to approximately 85% of the internal diameter of the raceway to be tested. Two (2) short wire brushes shall be included in the mandrel assembly. Snaking of conduits, ducts, etc., shall be performed by the Contractor in the presence of the Electrical Inspector. Any conduits or ducts which reject the mandrel shall be cleared at once with the Contractor bearing all costs, such as chopping concrete, to replace the defective conduit and restore the surface to its original condition.
- b. TAGS - Numbers or letters shall be assigned to the various conduit runs, and as they test clear they shall be identified by a fiber tag not less than 1-¼ inch width, attached by means of a nylon cord. All conduit terminations in panel, splice or pull boxes as well as those out of the floor or ceiling shall be tagged.
- c. TEST RECORDS - As the conduit runs clear, a record shall be kept under the heading of "Empty Conduit Tested, Left Clear, Tagged and Capped" showing conduit designation, diameter, location, date tested and by whom. When complete, this record shall be signed by the Electrical Inspector and submitted in triplicate for approval. This record shall be entered on the Record drawings, which are required under "General Conditions Governing All Contracts."
- d. CAPPING - All empty conduit and duct openings, after test, shall be capped or plugged by the Contractor as directed.
- e. DRAG LINES - A drag line shall be left in all empty conduit.

C. BOXES

1. The Contractor shall furnish and erect all pull boxes indicated on the plans or where required. Sides, top and bottom of pull boxes shall be zinc coated and shall be built of No. 12 USSG steel reinforced at corners by substantial angle irons and riveted or welded to plates. Bottom or side of pull boxes shall be removable and held in place by corrosion resistant machine screws. Pull boxes in damp locations shall have threaded hubs and gaskets. All pull boxes shall be suspended from ceiling or walls in the most substantial manner.
2. For large boxes, sufficient suitable porcelain clamp insulators or other approved devices shall be provided in the pull boxes for supporting the cables passing through the box so that the cables will not be unsupported for a distance greater than three (3) feet and so as to permit a neat and orderly arrangement of the cables.
3. For pull boxes having the largest side more than nine (9) square feet in area, special rectangular and diagonal angle-iron bracing will be required as approved.
4. Pull boxes of special or odd shapes are required to be installed by the Contractor, even though not shown on plans, where necessary to overcome interference or to facilitate the pulling of conductors in conduits.
5. In centering outlets, the Contractor is cautioned to allow for overhead pipes, ducts and other obstructions, and for variations in arrangement and thickness of fireproofing, soundproofing and plastering. Precautions should be exercised regarding the location of window and door trims,

paneling, etc. Mistakes resulting from failure to observe these precautions, must be corrected by the Contractor without cost to the City. Outlets in hung ceilings shall be supported from the black iron or structure.

6. The exact location of all outlets in finished rooms shall be as directed. When the interior finish has been applied, the Contractor shall make any necessary adjustment of its work to properly center the outlets. All outlet boxes for local switches near doors shall be located at the strike side of doors as finally hung, whether so indicated on the drawings or not.
7. Exposed wall outlet boxes shall be erected neatly and tight against the walls and securely anchored to same.
8. All wall outlets of each type shall be set accurately at the same level on each floor, except where otherwise specified or directed. Where special conditions occur, outlets shall be located as directed.
9. MOUNTING HEIGHTS - The following heights are standard heights and are subject to correction due to coordination with Contract Drawings. All such changes must be approved by the Resident Engineer. Heights given are from finished floor to center line of outlet or device on wall or partition, unless otherwise indicated.

a. General Convenience Outlets (mount vertical)	1'-6"
b. Clock Outlets	8'-6" or 1'-6" below ceiling
c. Wall Lighting Switches	4'-0"
d. Motor Controllers	5'-0"
e. Motor Push-button	4'-2"
f. Telephone Outlets	As Directed
g. Fire Alarm Bells	8'-6" or 1'-6" below ceiling
h. Fire Alarm Stations	4'-0"
i. Intercom Outlet	1'-6"
j. Cooking and Refrigerator Unit	As Directed
10. Outlet boxes shall be of approved design and construction; of form and dimensions suited and adapted to its specific location; the kind of fixture to be used and the number and arrangements of conduits, etc., connecting therewith. All ferrous outlet boxes shall meet the requirements for zinc coating as specified under Electrical Conduit Systems.
11. There shall be knockouts opened only for the insertion of conduit. Any outlet boxes with more openings than are necessary for conduit insertion, shall be sealed by the Contractor without additional charge.
12. All outlet boxes and junction boxes for exposed work shall be galvanized cast iron or cast aluminum with threaded openings. Outlet boxes for exposed inside work in damp locations shall be galvanized cast iron or cast aluminum with threaded hubs and neoprene gaskets.
13. Junction boxes shall not be less than 4 11/16" square and shall be equipped with zinc coated plates. Where plates are exposed they shall be finished to match the room decor.
14. FIXTURE SUPPORTS - Outlet boxes supporting lighting fixtures shall be equipped with fixture studs held by approved galvanized stove bolts or integral with the box. Cast iron or malleable boxes shall have four (4) tapped holes for mounting required cover or fixtures.
15. Outlet boxes exposed to the weather or indicated W.P., shall be cast iron or cast aluminum and the covers made watertight with neoprene gaskets. The boxes shall have external lugs for mounting. Drilling of the body of the fitting for mounting will not be permitted. The cover screws shall be appropriate in size, noncorrodible and not less than four (4) in number for each box opening.

PART E - ELECTRICAL WIRING DEVICES (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

- A. WALL SWITCHES shall be of the best specification grade, quiet type, and shall have a rating of 20 Amperes at 277 volts, as manufactured by Bryant, Hubbell or approved equal. The mechanism shall be equipped with arc snuffers. They shall be of the tumbler type, single pole. Switches of the 3-way type shall have a similar rating.
- B. RECEPTACLES
1. CONVENIENCE OUTLETS - shall be of the best specification grade, duplex, two-pole, 3-wire, 15 Amperes at 125 volts. It shall have a grounding pole that shall be grounded to the conduit system. Receptacles shall be capable of both back and side wiring and shall have only one (1) grounding screw. Receptacles shall be Hubbell Cat. #5262 or approved equal.
 2. HEAVY DUTY RECEPTACLE OUTLETS - shall have the Ampere rating and the number of poles specified on the Contract Drawings and shall be Hubbell, Russell-Stoll, Bryant, AH & H or approved equal. Each outlet shall have a grounding pole, which shall be grounded to the conduit system.
 3. FLOOR RECEPTACLES - shall be Russell & Stoll #3040 or approved equal, to fit into floor box previously specified.
 4. NAMEPLATES - are required for all receptacles other than 120V.
- C. CLOCK HANGERS - Clock outlets for surface type clocks shall be equipped with a supporting hook and recessed faceplate to conceal the electrical cord.
- D. WATERTIGHT DEVICES - For installations exposed to weather or in damp locations, the devices shall be in a gasketed, cast iron enclosure.
- E. PLATES
1. Every convenience outlet and switch outlet shall be covered by means of a stainless steel No. 302 - 0.4" antimagnetic plate with an approved finish, unless provided otherwise in the detailed Specifications.
 2. Where two (2) or three (3) switches are grouped together a single faceplate shall be used. Where more than three (3) switches are located at one (1) point, the faceplates may be made up in multiple units.

PART F - ELECTRICAL CONDUCTORS AND TERMINATIONS (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

- A. CONDUCTORS FOR LIGHT AND POWER - All wire and cable shall be of annealed copper of 98% conductivity. Aluminum wire or cable will not be permitted. The insulation shall be flame retardant, moisture and heat resistant, thermoplastic, type THW or THWN rated for 600 volts at 75 degrees C. for both wet and dry locations. Wires No. 8 or larger shall be stranded. Wires and cables shall also be subject to the requirements of the NYCEC. Cables for incoming service or wire in conduits contiguous with the earth or in concrete or other damp or wet locations shall be synthetic rubber insulated with neoprene jacket, heat and moisture resistant and shall be equal to UL Type USE and rated for 600 volts at 75 degrees C. for both wet and dry locations.
- B. FIXTURE WIRE - Lighting fixtures shall be wired with No. 14 gauge wire designated as AWM and rated at 105 degrees C.
- C. OTHER TYPES - Cables and wires for interior communication systems are described in detailed

Specifications of applicable Contracts.

- D. **MINIMUM SIZE** - Conductors smaller than No. 12 AWG shall not be used for light or power.
- E. **COLOR CODE** - Wires shall have a phase color code, and multiple conductor cables shall be color coded.
- F. **CABLE DATA** - The Contractor shall submit for approval the following information for each size and type of cable to be furnished.
 - 1. **Manufacture of Cable - Location of Plant.**
 - 2. **Minimum insulation resistance at standard test temperature.**
 - 3. **Days required for delivery to site of work after order to proceed with manufacture.**
- G. **ORIGINAL REELS** - Cable and wire shall be delivered to the site of the work on original sealed factory reels.
- H. **TESTS**
 - 1. **NOTIFICATION OF TEST** - No cable shall be released for shipment from the mill unless authorized by the Commissioner. The Contractor shall give the Commissioner at least 10 days notice when the cable will be available for testing at the mill. The Contractor's representative or inspector shall have access during working hours to all parts of the plant where the cable is being manufactured, and all reasonable inspection and testing facilities shall be afforded to the Contractor without increase in price to the City. The Inspector shall witness the complete test of cable and receive a copy of all test data.
 - 2. **TEST DATA** - The Contractor shall forward to the Commissioner six (6) copies of all test data for approval before accepting shipment of the cable.
 - 3. **INSPECTION DURING MANUFACTURE** - The Commissioner reserves the right to dispatch a representative to the factory at any time during the period of manufacture of the cable for the purpose of expediting or checking progress. The living and traveling expenses of the City Engineers making these inspections and witness tests will be borne by the City of New York.
 - 4. **TEST IN CITY LABORATORY** - Sufficient additional length of conductor shall be provided on each reel, so that a six (6) foot sample may be removed for testing in the City's Laboratories. This sample shall be cut from the reel in the presence of the Inspector of the Department of Design and Construction and cut in two (2) three-foot lengths, each piece to be tagged showing reel number, size and type, manufacture, date, name or project & Contract number. Samples shall be handed to the Inspector for transmittal. If it is found as the result of test that the cable does not comply with the approved factory test the Contractor will be ordered to remove all cable which came off the reel and has been installed, and to replace the defective cable not used, without cost to the City. The Contractor will be held responsible for any delays in the construction program caused by the defective cable.
 - 5. **FINAL FIELD TEST** - After conductors are installed and connected, the City will test the work for overall insulation resistance. The Contractor shall furnish all test equipment necessary. To be acceptable, the test shall meet the requirements set forth in the NYCEC.
- I. **WIRE INSTALLATION**
 - 1. **INSTALL WIRES AFTER PLASTERING** - Feeder and branch circuits wiring shall not be installed in conduit before the rough plastering work is completed. No conductors shall be pulled into floor conduits before floor is poured.

2. CONDUIT SECURED IN PLACE - No conductor shall be pulled into any conduit run before all joints are made up tightly and the entire run rigidly secured in place.
3. WIRE ENDS - All wires shall be left with sufficiently long ends for proper connection and stowing.
4. PULLING COMPOUNDS - When required to ease the pulling-in of wires into conduit, only approved compounds as recommended by cable manufacturers shall be used.
5. PRESSURE CONNECTORS - for wires shall be of the cast copper or forged copper pressure plate type. Connectors shall be O.Z., Burndy, National Electric Products or approved equal.
6. Splices and feeder taps in the gutters of panel boxes shall be made by means of pressure plate type connectors encased in composition covers as manufactured by O.Z., Burndy, National Electric Products or approved equal.
7. Splices in branch wiring for sound systems and fire systems, shall be first made mechanically secure, then soldered and taped.
8. In lieu of soldered splices (except for sound and Fire Systems, which must have soldered splices) the following alternates are acceptable for operating temperatures up to 105 degrees C., for fluorescent fixtures and for the splicing of branch circuit wiring up to No. 8 AWG wire:
 - a. Mechanical splices made with mechanical connectors as manufactured by the Minnesota Manufacturing Company "Scotchlock" or approved equal. Mechanical connectors requiring a special tool (pressure connectors, insulators and locking rings) by Buchanan or approved equal. The tool used for connector application shall be as approved by the connector manufacturer.
 - b. For wire and cable No. 6 AWG and larger for branch circuit wiring the seamless tubular connector will only be accepted. Application of this connector shall be with a tool recommended by the connector manufacturer.
9. TAGS - All feeders and risers shall be tagged at both ends, and in all pull and junction boxes and gutter spaces through which they pass. Such tags shall be of fiber and have the feeder designation and size stamped thereon.
10. BRANCH CIRCUIT WIRING
 - a. The Contractor installing branch circuit wiring shall test the work for correct connections and leave all loop splices in the fixture outlet boxes properly spliced and taped. The Contractor shall provide wire ends long enough for convenient connection to device.
 - b. NEUTRALS - No common neutrals shall be used except for lighting branch circuits. Each neutral wire shall be terminated separately on a neutral busbar in the panelboard. No common neutrals will be permitted for convenience receptacle branch circuits.

J. TERMINATIONS

1. LUGS - All lugs for all devices and all cable terminations shall be copper. AL/CU rated lugs will not be permitted. The only exception to this requirement is when the particular device is not manufactured with copper lugs by any manufacture. Lugs for No. 6 AWG cable and larger shall be cast copper or forged copper pressure plate type. Lugs for 1/0 and larger shall be fastened with two (2) bolts.
2. All lugs shall be of the proper size to accept the cable connected to them. Any Contractor furnishing a device containing lugs is to coordinate with the Electrical Work Contract Documents to insure that the device terminations are adequate for the wire or cable (whose size may be larger than expected due to voltage drop considerations) connected to the device. This requirement

applies to both the Contractor for Electrical Work whose branch circuit protector must have lugs of the proper size, as well as to the Contractor who furnishes the device who may have to increase the size of that particular device.

PART G - CIRCUIT PROTECTIVE DEVICES (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

SCOPE - This Section sets forth the circuit protective devices such as circuit breakers and safety switches, used in connection with Motor Control Equipment, Distribution Centers, Panelboards and Service Entrance.

A. CIRCUIT BREAKERS

1. **CIRCUIT BREAKERS** shall be operable in any position and shall be of the quick-make, quick-break type on manual operation. The handle shall be trip free, preventing contacts from being held in closed position against abnormal overloads or short circuits. Positive visual indication of automatic tripped position of breaker shall be provided, in addition to the "On" and "Off" indication. All circuit breakers shall be of the bolted type.
2. **TRIP RATING** - Circuit breakers shall be provided with the required number of trip elements, calibrated at 40 degrees C., ambient temperature, in accordance with wire sizes or motor currents as shown on Contract Drawings or indicated in the Specifications.
3. **POLE BARRIERS** - Multipole pole breakers shall be designed to break all poles simultaneously. They shall be provided with barriers between poles and arc suppressing devices.
4. **ELEMENTS** - Multipole circuit breakers shall have frames of not less than a 100 Ampere rating. Multipole circuit breakers for 480 volts AC operation shall have an NEMA interrupting rating of 18,000 Amperes, unless a higher rating is specified in the Specific Requirements or indicated on the Contract Drawings.
5. For circuit breakers with frame size up to and including 225 Amperes, the breakers may be provided with non-interchangeable trip elements. For frame ratings above 225 Amperes, the breakers shall be provided with interchangeable trip elements, which can be replaced readily.
6. The trip rating of all circuit breakers shall not exceed 70% of frame rating.
7. Single pole circuit breakers for branch circuits shall have a frame size of no less than 100 Amperes, and shall be rated at 125 volt A.C. with a NEMA interrupting rating of 10,000 Amperes, unless a higher rating is specified in the Specific Requirements or indicated on the Contract Drawings.
8. **INVERSE TIME ACTION** - The circuit breakers shall be dual element type, one (1) element with time limit characteristics, so that tripping will be prevented on momentary overloads, but will occur before dangerous values are reached, the other with instantaneous trip action. Inverse time delay action shall be effective between a minimum tripping point of 125% of rating of breaker and an instantaneous tripping point between 600% and 700% of rated current.
9. **CONSTANCY OF CALIBRATION** - The tripping elements shall insure constant calibration and be capable of withstanding excessive short circuit conditions without injury.
10. **CONTACTS** shall be non-welding under operating conditions and of the silver to silver type.
11. **TEMPERATURE RISE** - Current carrying parts, except thermal elements shall not rise in temperature in excess of 30 degrees C. while carrying rated current at rated frequency.
12. **NUMBERING** - Each circuit breaker shall be distinctly numbered when installed in a group with other breakers. The calibration of trip element shall be indicated on each breaker.

B. SAFETY SWITCHES

NEMA TYPE HD - When safety switches are permitted to be used for service entrance, motor disconnecting means or to control other types of electrical equipment, they shall be of the type HD of a rating not less than 30 Amperes. Enclosures shall be provided with means for locking. For ratings above 60 Amperes terminals shall have double studs.

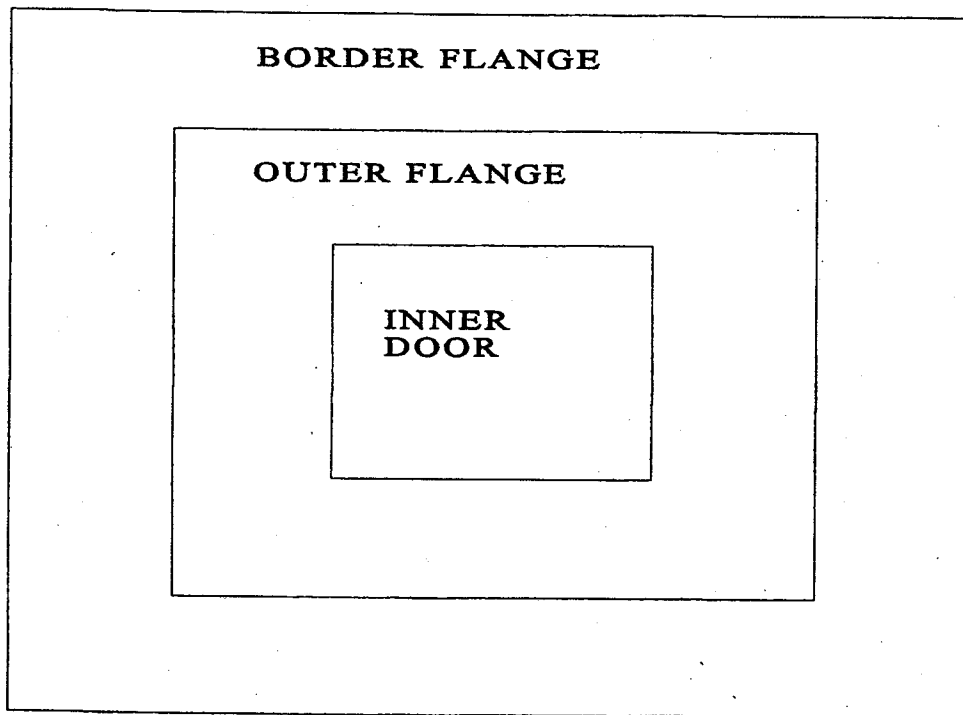
PART H - DISTRIBUTION CENTERS (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

SCOPE - This Section sets forth the construction and installation procedure for Switchboards, Panelboards and Cabinets.

- A. **PANELBOARDS--GENERAL TYPE** - The panelboards shall be of the automatic circuit breaker type with individual breakers for each circuit, removable without disturbing the other units. Circuit breakers shall be in accordance with the requirements outlined under "Circuit Protective Devices."
- B. **NUMBER AND RATING OF CIRCUIT BREAKERS** - The Contract Drawings show a layout of each panel, giving the number, frame, size and trip setting of circuit breakers and number of branch circuits and spare breakers. Each branch circuit shall be distinctly numbered.
- C. **BUS-BAR CONSTRUCTION AND SUPPORT** - Panel Boards shall be of the deadfront type and shall have bus bars and branch circuits designed to suit the system and voltage. Current carrying parts, exclusive of circuit breakers shall be copper and based on a maximum density of 1,000 Amperes per square inch. Bus bars for the main switchboard shall be designed for the frame rating of the Service Breaker. Bus bars shall run up the center of the panel, unless otherwise indicated, and shall have connected thereto the various branch circuits. Unless otherwise specified, bus bars for each panelboard shall be equipped with main lugs only and capacity as required on Contract Drawings. Where main protection is required, automatic circuit breakers shall be used. A neutral bus of at least the same capacity as a live bus bar shall be provided for the connection of all neutral conductors. Each terminal shall be identified. All current carrying parts, exclusive of circuit breakers, shall be of copper with a minimum number of joints. The bus bar structure shall be a self supporting unit, firmly fastened to a 1/2 inch plastic board, extending the full length and width of assembly which shall serve to insulate the bus structure from the back of panel box. Other methods affording equally effective bus structure support and insulation will be given consideration. An insulating barrier shall separate neutral bus from other parts of panel.
- D. **CIRCUIT BREAKER ASSEMBLY** - The entire circuit breaker and bus bar assembly shall be mounted on an adjustable metal base or pan and secured to the back of panel box. The panel shall have edges flanged for rigidity.
- E. **PANEL MOUNTING** - The panel shall be centered in the panel box to line up with door openings and set level and plumb so that no live parts are exposed with the door open.
- F. **PANEL CABINET CONSTRUCTION AND SUPPORT**
1. Panel boxes shall be fabricated from No. 12 USSG sheet steel of no more than three-piece construction, reinforced at the corners and with continuous welds. Boxes having a back whose area is larger than 16 square feet, shall be of No. 10 USSG sheet steel and reinforced to provide ample stiffness and to prevent buckling. Boxes shall be of sufficient size to afford a clear gutter space on all sides, of not less than six (6) inches.
 2. **PANEL CABINET INSTALLATION** - When installed surface, or in panel closets, they shall be mounted on Kindorf channel, supported from floor slab to ceiling slab.
 3. Where cabinets cannot be set entirely flush due to shallow walls or partitions or where cabinet is extra deep, the protruding sides of cabinet shall be trimmed with a metal or hardwood return

molding of approved design and fastened to cabinet so as to conceal the intersection between the wall and cabinet.

- G. **CABINET TRIM** - Trim for both lighting and power panelboards shall be door-in-door type installation as depicted in **DETAIL A TRIM FOR LIGHTING AND POWER PANELBOARDS**. Construction details are to be as described in the following paragraphs.



DETAIL A TRIM FOR LIGHTING AND POWER PANELBOARD

1. **CABINET TRIM** - The trim and doors for lighting and power panels shall be made of No. 12 USSG full finish sheet steel in one (1) piece. Cabinet trim larger than 16 square feet shall be made of No. 10 USSG. The inner door shall cover the circuit breaker section only and be provided with appropriate brass hinges. The outer door shall cover the entire gutter space and shall be attached to the border type flange with appropriate hinges. Both doors for power panels shall be provided with a New York City Lock No. 511S, with key change to No. 47 and two (2) keys. For lighting panels, the inner door shall be provided with a substantial catch. All hinges shall be of the concealed type. Locks shall be flush with trim. In addition, for panels requiring doors over 48 inches in height, furnish a vault handle and a 3-point catch arranged to fasten door at top, bottom and center.
2. The door shall close against a flange or rabbet to afford a dust tight fit. All space between the panel and the cabinet trim shall be closed by means of a sectional plate secured to the trim.
3. The border flange of the trim shall be fastened to the box with oval head screws finished to prevent corrosion or with approved trim clamps.
4. To facilitate installation of trim, a suitable angle iron shall be spot welded across the bottom of each trim to carry the weight of the trim while the holding screws are being put in place.

- H. **MOTOR CONTROL CENTERS** - Motor centers shall be furnished by the Contractor as indicated in the Specifications or Contract Drawings, but shall be installed by the Contractor for Electrical Work.

- I. **NAMEPLATES** - Nameplates where required, shall be made of engraved Lamicoid sheet, or approved

equal. Letters and numbers shall be engraved white on a black background (except for Firehouse projects which shall have white letters on a red background) the Contractor shall submit an engraved sample for approval as to design and style of lettering before proceeding with the manufacture of the nameplate. Nameplates shall be of suitable size and shall also be provided at the top of the switchboard or section thereof and on the trim at the top of all lighting and power panels. Similar nameplates shall also be provided for each distribution circuit breaker giving the breaker number, the number of the feeder, and the name of the equipment fed.

- J. SHOP DRAWINGS - showing all details of boxes, panels, etc., shall be submitted for approval.
- K. DIRECTORIES - A directory shall be fastened with brass screws and consist of a noncorrosive metal frame with dimensions not less than five (5) inches x eight (8) inches and a transparent window of Plasticile, Plexiglass, Lucite or approved equal that is not less than 1/16 inch thick over cardboard or heavy paper. The directory shall be typewritten and show the number of each circuit, the name of circuit and lighting or equipment supplied. The size of riser feeder shall be as indicated on directory. The dimensions of directory shall be submitted for approval for each size of panel.
- L. CONSTRUCTION
 - 1. FINISH - Panel boxes, doors and trim for installation in dry locations, shall be zinc coated after fabrication by the hot-dip galvanizing or electroplate process on inside and outside surfaces. In damp locations, panelboards shall be enclosed and gasketed NEMA 3R type. Panelboards located outdoors or exposed to the weather shall be cast iron.
 - 2. PAINTING - Panel boxes, doors and trim shall receive a coat of approved priming paint and a second coat of approved paint in the field after installation. Paint shall be applied to the inside and outside of boxes and on both sides of trim. Panel trims and doors shall receive a third or finishing coat on the outside after installation. Approval as to texture and color must be obtained before the final coat is applied. All of the aforementioned painting is to be done by the Contractor who furnishes the boxes and trim. Where panel trims or boxes are installed on walls which are to be painted, the previously mentioned third or finishing coat of paint shall be included in the work of the Contractor who has the Contract for general interior painting.

PART I - MOTORS (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

SCOPE - This Section sets forth the general design, construction and performance requirements, which shall apply to all motors furnished in any of the Contracts.

- A. MOTOR DESIGN - All motors shall be designed to comply with the New York State Energy Code currently in effect. Motors shall have standard NEMA frames and shall have nameplate ratings adequate to meet the specified conditions of operation. Motor performance under variable conditions of voltage and frequency shall be within the limits set in NEMA standards, unless modified in present Specifications. Motors shall be expressly designed for the hazard duty load, voltage and frequency as specified in the Contract. All motor windings shall be copper. All motors intended to operate on a 208 volt system shall be designed and rated for 200 volts.
- B. MOTORS OF SAME MANUFACTURER - Unless expressly permitted otherwise by the Commissioner, all motors under the same Contract shall be manufactured by the same company. Exceptions may be granted in the case of motors of 1/4 horsepower rating and smaller, or for a motor that is an integral part of the equipment, with its housing especially built for this purpose.
- C. STANDARDS OF COMPARISON - In general, the best standard products of the leading motor manufacturers shall be considered as a standard for comparison. The requirements of the NEMA standards for motors and generators shall be deemed to contain the minimum requirements of performance and design.
- D. OBJECTIONABLE NOISES - Objectionable noises will not be tolerated and exceptionally quiet motors

may be required for certain specified locations. Noise control tests as per the Building Code of the City of New York may be performed as directed by the Commissioner. Such motors shall bear a nameplate lettered "Quiet Motor." Springs and slip rings shall be of approved non-ferrous material.

E. BEARINGS

1. Bearings, unless specified otherwise, shall be of the ball or roller type. Motors one (1) horsepower and larger that are equipped with ball roller bearings shall also have lubrication of the pressure-relief greasing type. Each Contractor who furnishes four (4) or more such motors shall also furnish, as part of its Contract, a pressure grease gun of rugged design, of approximately 10 ounce capacity, complete with necessary adapters. The Contractor shall also provide 10 pounds of approved gun grease.
2. For any particular unit where sleeve bearings are deemed desirable, permission for their use may be granted by the Commissioner. Motors one (1) horsepower and larger that are equipped with sleeve type bearings shall in addition to having protected accessible fittings for oiling be provided with visible means for determining normal oil level. Lubrication shall be positive, automatic and continuous.

F. MOTOR TERMINALS AND BOXES - Each motor shall be furnished with flexible leads of sufficient length to extend for a distance of not less than three (3) inches beyond the face of the conduit terminal box. This box shall be furnished of ample size to make and house motor connections. These requirements shall be met irrespective of any other standards or practices. Size of cable terminals and conduit terminal box holes shall be subject to approval. For motors five (5) horsepower or larger, each terminal shall come with two (2) cast or forged copper pressure type connectors with bolts, nuts and washers. For motors of smaller ratings, connectors of other acceptable types may be furnished. For installations exposed to the weather or moist locations, terminal boxes shall be of cast iron with threaded hubs and gasketed covers. Cover screws shall be of non-corrosive material.

G. MOTOR TEMPERATURE RISES - The motor nameplate temperature rises for the various types of motor enclosures shall be as listed below:

- | | |
|---|---------------|
| 1. Open Frame | 40 degrees C. |
| 2. Totally enclosed and enclosed fan cooled | 55 degrees C. |
| 3. Explosion proof and submersible | 55 degrees C. |
| 4. Partially enclosed and drip proof | 40 degrees C. |

The temperature of the various parts of a motor shall meet the requirements of NEMA standards for the size and type of the motors. Tests for heating shall be made by loading the motor to its rated horsepower and keeping it so loaded for the rated time interval or until the temperature becomes constant.

H. SPECIAL CODE INSTALLATIONS - Electrical installations covered by special publications of NBFU and by special City rulings and regulations shall comply in design and safety features with such applicable codes, regulations and rulings, and shall be furnished and installed complete with all accessories and safety devices as therein specified.

I. MOTORS ON LIGHTING PANELS - The largest A.C. motor permitted on branch circuits of lighting panels shall not exceed 1/4 horsepower.

J. MOTORS RATED 1/2 horsepower and larger shall be polyphase.

K. TESTS

1. **FACTORY INSPECTION** - Electrical equipment and devices (except portable) not covered by standard Specifications or tests herein prescribed shall be inspected and witnessed on test at the factory with the tested equipment being completely assembled and connected under conditions approved by the Commissioner as equivalent to the actual working conditions. Suitability and

ruggedness of the design for the specified purpose will be a condition for acceptance.

2. **SHOP TESTS** - to determine the load performance of motors shall be made in accordance with Standard C-50, of the ASA. Motors shall meet the requirements of C-50 for insulation resistance, dielectric strength, efficiency and temperature rise. Efficiency (and power factor for A.C. motors) shall be established for 50, 75 and 100 percent of rated horsepower but for motors of 100 horsepower or larger, the 125 percent loading shall be included.
 3. **TEST REPORTS** - The result of shop tests shall be submitted to the Commissioner for approval and shall be on forms approved by the City. The evaluated test data shall include a signed statement confirming the fact that the equipment meets the requirements of the standards of performance.
 4. **MANNER OF TEST** - For motors of 100 horsepower or smaller, check tests against complete tests of similar motors will be accepted. For motors larger than 100-horsepower, complete tests for each motor furnished shall be made, and certified test data sheets shall be submitted for approval, unless shop tests are required by the Detailed Specifications.
 5. **PREFERRED METHODS** - The efficiency of fractional horsepower motors shall be determined by the input-output method; for larger motors up to and including 100 horsepower, the separate loss method as specified in ASA Standards C-50 will be accepted unless otherwise required in the Specifications.
- L. **SPARE PARTS** - The Contractor who furnishes motors, including fractional horsepower, shall provide the following spare parts and accessories in connection therewith:
1. **BRUSHES** - One (1) additional set of brushes for each motor equipped with them.
 2. **BEARINGS** - For each group of three (3) and fraction thereof, of each type and size of motor, the Contractor shall furnish one (1) set of extra bearing linings or ball or roller bearings. Where less than three (3) of any type of motor is involved, one (1) set of extra bearings shall be furnished.
 3. **SPRINGS** - One (1) set of brush springs used in slip ring motor or universal type motors.
 4. **WRAPPER MARKING** - All parts shall be delivered neatly and securely wrapped and boxed, plainly tagged and marked for identification and reordering.

PART J - MOTOR CONTROL EQUIPMENT (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

SCOPE - This Section sets forth the requirements for motor controllers and associated devices, which are applicable to all Contracts under which motor control equipment is furnished or installed.

- A. **MANUFACTURER** - All control equipment furnished under one (1) Contract shall be the product of a single manufacturer. Exceptions to this rule may be granted in the case of controllers for fractional horsepower motors driving special equipment, the various units of which have been engineered to obtain specific performance.
- B. **CONTROL ITEMS REQUIRED** - The Contractor who furnishes a motor shall also furnish therewith complete disconnecting, starting and control equipment as required by the detailed Specifications, the various code authorities and for the successful operation of the driven equipment. These items include circuit breaker, magnetic starter with overload protection and low voltage release or protection, push button stations, pilot lights and alarms, float, pressure, temperature and limit switches, load transfer switches, devices for manual operation and speed controllers, etc. The Contractor shall furnish as many of these items as are required for the successful operation of the driven unit.
 1. Where a motor is to be located out of sight of the controller, the Contractor who furnishes the motor shall furnish an approved disconnecting means to be mounted near motor.

C. TYPES OF STARTERS

1. SQUIRREL CAGE - A.C. motors of the squirrel cage type, rated from one (1) to 30 horsepower shall have magnetic across the line starters; motors rated above 30 horsepower shall be furnished with reduced voltage (autotransformer type) starter or part winding start with time delay to reduce inrush current. Size of starters shall be based on 200V. operation.
2. SLIP RING - A.C. Motors of the slip-ring type shall be furnished with primary across the line starters interlocked with secondary starting and regulating equipment. The interlocking feature shall prevent starting of the motor when the secondary controller is off the initial starting point.
3. MAGNETIC - For fractional horsepower motors, magnetic type starters are not required unless the particular method of controlling the driven equipment makes them necessary. Where individual single phase fractional horsepower motors or the sum of fractional horsepower motors controlled by an automatic device are $\frac{1}{2}$ horsepower or more, magnetic starters and circuit breakers shall be used. Single phase A.C. motors smaller than $\frac{1}{2}$ horsepower or three-phase A.C. motors smaller than one (1) horsepower where manual control is specified may be furnished with starters of toggle switch or push button type with inbuilt thermal protection. No additional disconnecting means is required to be furnished with this type of starter. This type of starter may also be used in series with automatic control devices such as thermostats, float and pressure switches, provided the individual motor or the sum of fractional horsepower motors is less than $\frac{1}{2}$ horsepower. Means for manual operation shall be provided.

D. DISCONNECTING BREAKER - All motor starters, unless otherwise specified shall be provided with a disconnecting means in the form of a circuit breaker of the type specified under "CIRCUIT PROTECTIVE DEVICES" of the General Conditions. This disconnecting means shall be contained in the same housing with the starter and shall be operable from outside. Means shall be provided for locking the handle of the circuit breaker in the "OFF" position if it is desired to take the equipment out of service and prevent unauthorized starting.

E. CONTROL CABINET - DRY LOCATIONS - all starters shall be furnished with general purpose, NEMA Type 1, sheet metal enclosures with hinged covers and baked enamel finish.

F. CONTROL CABINET - WATERTIGHT - In wet locations, cast iron watertight enclosures with threaded hubs, galvanized and gasketed hinged covers shall be provided.

G. 1. PANELS - Motor control devices and appliances shall be mounted on approved insulating slabs with all wiring and connections made on the back of the slabs.

2. WIRING AND TERMINALS - Wiring connections for currents of 100 Amperes or less may be made with copper wire or cable with special flameproof insulating coverings. Such wires shall be installed in a neat workmanlike manner, flat against the slab, and held in place by clips. Connections shall be made with pressure connectors for No. 8 AWG and larger wires, and with grommets for small stranded wires. Except for incoming and outgoing main leads, all connections shall terminate on approved connector blocks, which may be installed on the face of the slab. For small, across the line starters the above requirements may be modified if satisfactory connections are provided.

3. COPPER BUS - For currents exceeding 100 Amperes, copper bus shall be used in place of wires. The bus shall be constructed of copper rods, tubing or flat strap, bent and shaped properly and securely attached to the slab in a neat and workmanlike manner. The cross section of copper shall provide sufficient areas to keep current density at not more than 1,000 Amperes per square inch.

H. COOPERATION - The Contractors who furnish electrically operated equipment shall give to the Contractor for Electrical Work full information relative to sizes and locations of apparatus furnished by them which require electrical connections.

Equipment being installed by the Contractor for Electrical Work shall be delivered to the Contractor for Electrical Work by other Contractors in proper time and sequence so that the Contractor for Electrical Work shall be able to meet the Contractor for Electrical Work working schedule.

I. SPARE PARTS

1. FURNISH - Each Contractor shall furnish the following spare parts pertaining to equipment furnished by each Contractor.

One (1) set of contact fingers and springs and thermal elements for each three (3) (or fraction) of each size of magnetic contactor starter.

One (1) holding coil for each three (3) (or fraction) of each size of magnetic contactor starter.

2. WRAPPER MARKING - All parts shall be delivered to the Resident Engineer neatly wrapped and boxed and plainly tagged and marked for identification and reordering.

PART K - SCHEDULE OF ELECTRICAL EQUIPMENT

Schedule D requirements for electrical motor equipment may be included in one or more of the Specifications for the separate contracts for the Project. SCHEDULE D delineates the responsibilities of each separate contractor for electrical motor control equipment. SCHEDULE D is included in the Addendum to the General Conditions. In the event of any conflict between the Specifications and SCHEDULE D, SCHEDULE D shall take precedence, provided, however, in the event of an omission from SCHEDULE D (i.e., SCHEDULE D omits either a reference to or information concerning electrical motor equipment which is set forth in the Specifications), such omission from SCHEDULE D shall have no effect and the Contractor's obligation with respect to the electrical motor control equipment, as set forth in the Specifications, shall remain in full force and effect.

1.38 Safety

- A. Each Contractor shall provide and maintain all necessary temporary closures, guard rails, and barricades to adequately protect all workers and the public from possible injury. Any Contractor requiring removal of these items shall be responsible for the replacement of same.

1.39 Interruption of Services and of Project Facilities

- A. EVENING AND WEEKEND WORK - Where the work makes temporary shutdowns of the services unavoidable, they shall be made at night or on weekends or at such times that will cause no interferences with the established routines and operations of the projects in question.

1. Where weekend or evening work is required due to unavoidable service shutdowns, such work shall be performed at no extra cost to the City.

B. INTERRUPTION OF PROJECT FACILITIES

1. The Contractor shall not interrupt any of the services of the project nor interfere with these in any way without the permission of the Commissioner. Such interruption, or interferences, shall be made as brief as possible, and only at such time stated.
2. Under no circumstances will the Contractor, or its workers, be permitted to use any part of the project as a shop, without the permission of the Commissioner.
3. Unnecessary noise shall be avoided at all times and necessary noise shall be reduced to a minimum.
4. The facility operates 24 hours per day seven (7) days a week. Toilet facilities, water and electricity

must be operational at all times. No services of the project can be interrupted in any way without the permission of the Commissioner. Careful coordination of all work with the Resident Engineer must be done to maintain the operational level of the project personnel.

5. Contractors shall schedule their work to avoid noise interference that will affect the normal functions of the project. In particular, construction operations producing noises that are objectionable to the project functions will be scheduled at times of day or night, day of the week, or weekend, which will not interfere with the project personnel. Any additional cost resulting from this scheduling shall be borne by the specific Contractor.
6. The Contractor shall arrange to work continuously, including overtime, if required, to assure that services will be shut down only during the time actually required to make the necessary connections to the existing work.
7. The Contractor shall give ample written notice in advance to the Commissioner and project personnel of any required shutdown.

1.40 Separation of Work Between Trades (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

- A. SCHEDULE E – Requirements for various items of work are included in the Specifications for the separate contracts for the Project and in the General Conditions. Schedule E delineates the responsibilities of each separate contractor for various items of work, as well as the extent to which certain items involve coordination between trades. Schedule E is included in the Addendum to the General Conditions. The delineation set forth in Schedule E shall be taken as specific instruction to the Contractor that it is responsible for the listed items of work. Schedule E is not intended to limit the Contractor's responsibility for supervision and coordination as set forth in Paragraph B below. In the event of any conflict between the Specifications, the General Conditions and Schedule E, Schedule E shall take precedence; provided, however, in the event of an omission from Schedule E (i.e., Schedule E omits either a reference to or information concerning an item of work which is set forth in the Specifications or the General Conditions), such omission from Schedule E shall have no effect and the Contractor's obligation to perform the work, as set forth in the Specifications or the General Conditions, shall remain in full force and effect.
- B. SUPERVISION AND COORDINATION - Each Contractor is required to supply all necessary supervision and coordination information to any other trades who are to supply work to accommodate their installations.

1.41 Shop Drawing and Material Samples Schedule

- A. SCHEDULE F – Schedule F sets forth all submittal requirements for shop drawings and material samples. Schedule F is included in the Addendum to the General Conditions. At the kick-off meeting, each Contractor must review this Schedule with the Commissioner's Representative and the Consultant. Within 10 days after the kick-off meeting, the Contractor must complete information on Schedule F concerning the submission date, the required delivery date and the fabrication time. For all required submittals of shop drawings and material samples, the Schedule F provided by the Contractor must indicate a submission date which is at least 20 days prior to the date of the manufacture of the item or materials to be installed. In addition, if so directed by the Commissioner, the Schedule F provided by the Contractor must indicate a submission date for shop drawings and/or material samples of specified items or materials which is within 60 days after the kick-off meeting. In the event of any conflict between the Specifications and Schedule F, Schedule F shall take precedence; provided, however, in the event of an omission from Schedule F (i.e., Schedule F omits either a reference to or information concerning a submittal requirement which is set forth in the Specifications), such omission from Schedule F shall have no effect and the Contractor's submittal obligation, as set forth in the Specifications, shall remain in full force and effect.
- B. COORDINATION - The Resident Engineer for this project will coordinate and review the data submitted by various Contractors. Upon acceptance by the Resident Engineer, the Resident Engineer

will date and sign the schedule as approved and transmit it to the Consultant, Contractors and Project Manager within the Department of Design and Construction.

- C. ARTICLE 11 - Thereafter, this schedule will be subject to the provisions of Article 11 of the agreement and must be strictly adhered to by the Contractor.

1.42 Specific Requirements

- A. The work of this article shall be the responsibility of the Contractor for General Construction Work, unless otherwise indicated.

B. FIELD MEASUREMENTS

1. Each Contractor shall verify all dimensions and conditions on the job so that all work will properly join the existing work.
2. Each Contractor, before commencing work, shall examine all adjoining work on which each Contractor's work is in any way dependent on good workmanship in accordance to the intent of the Specification and Contract Drawings. The Contractor shall report to the Commissioner any condition that will prevent any Contractor from performing work that is below the required standard.

C. BORINGS (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

1. REFERENCE DRAWINGS - The Boring Drawings as listed on the title sheet are for information to the bidder and are to be used under the conditions as follows:
2. BORING LOGS - shown on the Boring Drawings, record information obtained under engineering supervision in the course of exploration carried out by or under the direction of forces of the Department of Design and Construction at the site.
3. SOIL AND ROCK SAMPLES - All inferences are drawn from the indications observed as made by engineering and scientific personnel. All such inferences and all records of the work including soil samples and rock cores, if any, are available to bidders for inspection.
4. CERTIFICATION OF SAMPLES - The City certifies that the work was carried out as stated, and that the soil samples and rock cores, if any were referred to, were actually taken from the site at the times, places and in the manner indicated. The samples are available for inspection in the Department of Design and Construction Subsurface Exploration Section.
5. BIDDER'S RESPONSIBILITY - The bidder, however, is responsible for any conclusions to be drawn from the work. If the bidder accepts those of the City, it must do so at its own risk. If the bidder prefers not to assume such risk, the bidder is under the obligation of employing its own experts to analyze the available information, and must be responsible for any consequences of acting on their conclusions.
6. CONTINUITY NOT GUARANTEE - The City does not guarantee continuity of conditions shown at actual boring locations over the entire site. Where possible, borings are located to avoid all obstructions and previous construction which can be found by inspection of the surface and the bidder is required to estimate the influence of such features from its own inspection of the site.

D. DEFERRED CONSTRUCTION

1. Where necessity for deferred construction is certified by the Commissioner, in order to permit the installation of any item or items of equipment required to be furnished and installed under any other Contract in effect concurrent with the time allowed for doing and completing the work of the Contract, the Contractor shall defer construction work limited to adequate areas as approved by

the Commissioner.

2. The Contractor shall confer with the affected Contractors and ascertain arrangements, time and facilities necessary to be made by the Contractor in order to execute the provisions specified herein.

E. WORK FENCE ENCLOSURE (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

1. The Contractor shall furnish and erect a wood fence to the extent shown on the drawings enclosing the entire project on all sides. All materials used shall be new. Any permit required for the installation and use of said fence shall be borne by the Contractor.
2. THE FENCE shall be 7'-0" high with framing construction of yellow pine, using 4" x 4" posts on not more than 6'-0" centers, with three (3) rails of at least 2" x 4" size to which shall be secured boards, 3/4" x 6" tongue and groove, laid solid and surface and double nailed to each bearing. Posts shall be firmly fixed in the ground at least 30" and thoroughly braced. Top edge of fence shall be trimmed with a rabbeted edge mould. Provide on the street traffic sides of fence, observation openings as directed. The Contractor has the option of using 1/2" exterior grade plywood in lieu of the 3/4" x 6" tongue and groove boards.
3. GATES - Provide an adequate number of double gates, complete with hardware, located as approved by the Resident Engineer. Double gates shall have a total clear opening of 14'-0" with two (2) 7'-0" hinged swinging sections. Hanging posts shall be 6" x 6" and shall extend high enough to receive and be provide with tension or sag rods for the swinging sections.
4. PAINTING - The fence and gates shall be entirely painted on the street and public sides with two (2) coats of approved lead and oil paint. The below-grade section of the posts shall be first creosoted or given a coat of tar base paint. Black stenciled signs reading "POST NO BILLS" shall be painted on fence with three (3) inch high letters on 25 foot spacings for the entire length of fence on street traffic sides. Signs shall be stenciled five (5) feet above the sidewalk.
5. It shall be the obligation of the Contractor to remove all posters, advertising signs, and markings, etc., immediately.
6. Where sidewalks are used for "drive over" purposes for Contractor vehicles, a suitable wood mat or pad shall be provided for protection of sidewalks.
7. Where required, make provision for fire hydrants, lampposts, etc.
8. REMOVAL - When directed by the Resident Engineer, the fence shall be removed.

F. PUMPING

1. Furnish and install all necessary automatically operated pumps of adequate capacity with all required piping to run-off agencies, so as to maintain the excavation, cellar floor, pits and exterior depressions and excavations free from accumulated water during the entire period of construction and up to the date of final acceptance of work of the Contract.
2. All pumps shall be maintained at all times in proper working order.

G. RESIDENT ENGINEER'S OFFICE

1. OFFICE SPACE IN EXISTING BUILDING (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

- a. The Resident Engineer will arrange for office space for sole use in the building where work is in progress. The Contractor for General Construction Work shall provide and install a lockset

for the door to secure the equipment in the room. The Contractor for General Construction Work shall provide two (2) keys to the Resident Engineer. After completion of the project the Contractor for General Construction Work shall replace the original lockset on the door and ensure its proper operation.

- b. The Contractor for General Construction Work shall provide one (1) telephone, where directed, for the exclusive use of the Resident Engineer. The Contractor for General Construction Work shall pay all costs for telephone service for calls within New York City limits for the duration of the project. The telephone service shall continue for a period of 90 days following substantial completion.
- c. The Contractor for General Construction Work shall provide the following equipment:
 - (1) Two (2) single pedestal desks, 42" x 32"; two (2) swivel chairs with arms and three (3) side chairs without arms to match desk. Two (2) lockers, metal olive green or gray, single units, 15" x 18" x 78" overall including 6" legs. Lockers to have flat key locks with two (2) keys each, General Steel products or approved equal. Two (2) full ball bearing suspension four (4) drawer vertical legal filing cabinets with locks approximately 52"H x 28 1/2"D x 18"W in a grey finish by Art Steel No. 2904L or approved equal.
 - (2) One (1) 9000 B.T.U. air conditioner or as directed by Commissioner. Wiring for the air conditioner shall be minimum No. 12 AWG fed from individual circuits in the fuse box.
 - (3) Two (2) metal wastebaskets, 13 inches square 15 inches high with rubber feet and corners by Art Metal Company No. 168 or approved equal.
 - (4) One (1) fire extinguisher one (1) quart vaporizing liquid type, brass, wall mounted by Pyrene No. C21 or approved equal.
 - (5) One (1) Crystal Springs water cooler with bottled water, Model No. LP14058 or approved equal to be furnished for the duration of the Contract as required.

2. TRAILER OFFICE (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

- a. The Contractor for General Construction Work shall provide at its own cost and expense a trailer and install and connect all utility services to trailer within twenty (20) days of start of work. The trailer shall have equipment having the minimum requirements hereinafter specified. Any permit required for the installation and use of said trailer shall be borne by the Contractor.
- b. The trailer shall remain the property of the Contractor for General Construction Work except that the file cabinets herein specified, shall become the property of the City of New York.
- c. Trailer shall be office type trailer of the following general minimum dimensions:
 - 1. Length, overall: 35 feet.
 - 2. Length, inside: 32 feet.
 - 3. Width, overall: 8 feet.
 - 4. Width, inside: 7 feet, 5 inches.
- d. Trailer shall be manufactured by International Trailer Company, Model No. 1 MU-35-D or Atlantic Trailer Corporation, Model No. F-36 or approved equal.
- e. The exterior of the trailer and the wheels shall be given an approved coat of exterior enamel. The enamel finish coat shall be DUPONT orange lacquer or approved equal. The trailer shall be lettered with black block lettering of the following heights with white borders:

CITY OF NEW YORK	2-1/2"
DEPARTMENT OF DESIGN AND CONSTRUCTION	3-3/4"
DIVISION OF STRUCTURES	3-1/2"
RESIDENT ENGINEER'S OFFICE	2-1/2"

NOTE: In lieu of painting letters on trailer the Contractor for General Construction Work may substitute a sign constructed of a good quality lumber with the same type and size of lettering above.

- f. All windows and doors shall have insect aluminum screens and wire mesh protective screening.
- g. The interior shall be finished in 1/4 inch plywood. Plywood shall be finished in natural color, with two (2) coats of varnish or lacquer.
- h. The interior shall be divided by partitions into one (1) large room in front of trailer, and a private office approximately 6' x 7' at rear of trailer and a washroom located adjacent to the private office.
- i. The washroom shall be equipped with a flush toilet, wash basin with two (2) faucets, medicine cabinet, complete with supplies by Hospital Supply and Watters Labs., Inc., Model No. 1 or approved equal and a toilet roll tissue holder. Plumbing and fixtures shall be approved house type, with each appliance trapped and vented and a single discharge connection. Five (5) gallon capacity automatic electric heater for domestic hot water shall be furnished.
- j. The heating system shall consist of thermostatically controlled electric baseboard heaters capable of delivering not less than 30,000 BTU per hour and heaters shall be as manufactured by Chromalox or approved equal, sized per area with individual approved thermostats.
- k. The trailer shall be equipped with an approved two-circuit, 110-120 volt armored cable wiring system of adequate capacity complete with entrance connector with provision for grounding, enclosed fused service switch and branch circuit fuse box. The circuits for lighting, water heater, heater and convenience outlets, etc. shall be two-conductor, No. 12. The circuits for the space heaters shall be sized minimum No. 12 wire led from individual circuits in the branch circuit fuse box. Metal boxes shall be provided at all outlet points. All wiring shall conform to the requirements of the Electrical Code of the City of New York for armored cable wiring systems.
- l. Lighting to be furnished by a minimum of four (4) 48 inch, single tube, fluorescent fixtures for the large rooms and an incandescent fixture for the washroom. Lighting fixtures shall be provided with built-in pull-chain switches. A minimum of six (6) duplex convenience outlets shall be installed; four (4) in the larger room and two (2) in the smaller room. These outlets shall be in addition to connections for electric space heaters and heaters for domestic hot water.
- m. In addition to the washroom and private office, the following shall be built-in to the trailer:
 - 1. The drafting or reference table at least 60 inches long by 36 inches wide with cabinet below, head shelf at each end of the trailer, wall type plan rack at least 42 inches wide and wardrobe opposite washroom.
- n. The following movable equipment shall be furnished:
 - 1. Four (4) single pedestal desks, 42" x 32"; two (2) swivel chairs with arms and three (3) side chairs without arms to match desk. Four (4) lockers, metal olive green or gray, single units, 15" x 18" x 78" overall including 6" legs. Lockers to have flat key locks with two (2) keys each, General Steel products or approved equal. Two (2) full ball bearing suspension four (4) drawer vertical legal filing cabinets with locks approximately 52" H x 28 1/2" D x 18"W in a grey finish by Art Steel No. 2904L or approved equal.
 - 2. One (1) 6000 B.T.U. and one (1) 9000 B.T.U. air conditioner. Wiring for the air conditioners shall be minimum No. 12 AWG fed from individual circuits in the fuse box.

3. Two (2) metal wastebaskets, olive green or grey finish, 13 inches square 15 inches high with rubber feet and corners by Art Metal Company No. 168 or approved equal.
 4. One (1) fire extinguisher one (1) quart vaporizing liquid type, brass, wall mounted by Pyrene No. C21 or approved equal.
 5. One (1) Crystal Springs water cooler with bottled water, Model No. LP14058 or approved equal to be furnished for the duration of the Contract as required.
- o. TRAILER TEMPORARY SERVICE - Plumbing and electrical work required for the trailer will be furnished and maintained as below.
1. PLUMBING WORK - shall include all water supply and drainage piping required for a complete installation. Contractor to provide a temporary water service from the City's water main and extend in the trailer and properly connect up all fixtures requiring water supply. Provide all necessary soil, waste, vent and drainage piping.
 - a. Plumbing Contractor to frost-proof all water pipes to prevent freezing.
 - b. REPAIRS, MAINTENANCE - The Plumbing Contractor provide repairs when and as required for a period of thirty (30) days after the date of substantial completion acceptance.
 - c. DISPOSITION OF PLUMBING WORK - At the expiration of the time limit set forth in Subparagraph 3, the water drainage connections and piping to the office trailer shall be removed and shall be plugged at the mains. All piping shall become the property of the Contractor for Plumbing Work and shall be removed from the site, all as directed. All repair work due to these removals shall be the responsibility of the Contractor for General Construction Work.
 2. ELECTRICAL WORK - The Contractor for Electrical Work shall furnish, install and maintain a temporary electric feeder to the trailer to be used by the Resident Engineer immediately after it is placed at the job site.
 - a. The temporary electric feeder shall be at least three (3) No. 6RH wire and shall be protected by a 60 Ampere fused safety switch, complying with codes and utility requirements having jurisdiction.
 - b. Make all arrangements and pay all costs to provide electric service.
 - c. Pay all costs for current consumed and for maintenance of the system in operating condition, including the furnishing of the necessary bulb replacements lamps, etc., for a period of thirty (30) days after the date of substantial completion acceptance.
 - d. Disposition of Electric Work: At the expiration of the time limit set forth, the temporary feeder, safety switch, etc., shall be removed and disposed of as directed.
 - e. All repair work due to these removals shall be the responsibility of the Contractor.
- p. MAINTENANCE
1. The Contractor for General Construction Work shall provide and pay all costs for hot and cold water, heat and fuel and regular daily janitor service. Furnish toilet paper, cloth towels and soap and maintain the field office in first-class condition, including all repairs, until 30 days after the date of substantial completion acceptance.
 2. Provide fire, extended coverage and vandalism, malicious mischief and burglary and theft

insurance coverage for the Resident Engineer's field office equipment in the amount of \$10,000. All insurance coverage shall be provided by a company licensed and authorized to do business in the State of New York. Such coverage must, under the loss payable clause or by endorsement thereon, state the following: "loss, if any, payable to the City of New York."

3. At 30 days after the date of substantial completion acceptance, or sooner as directed by the Commissioner, the Contractor for General Construction Work shall have all services disconnected and capped to the satisfaction of the Resident Engineer.
- q. The Contractor for General Construction Work shall provide and pay all costs for the following telephone services for the Resident Engineer's trailer:
 1. Two (2) desk phones
 2. One (1) wall phone (with six (6) foot extension cord) at plan table.
 3. A remote bell located on outside of trailer
 4. The telephone service shall continue for a period of 90 days following substantial completion.
- r. Should it become necessary to relocate the trailer or move the field office from one (1) location to another, Contractor for General Construction Work shall be responsible for move or moves and of reconnecting all utilities described above at new location, and shall assume all costs incurred.
- s. PERMITS - The Contractor for General Construction Work shall make the necessary arrangements and obtain all permits required for this work.
- t. The Contractor for General Construction Work has the option of providing, at its cost and expense, rented office or store space in lieu of trailer. Said space shall be in the immediate area of the Project and have adequate plumbing, heating and electrical facilities. Space chosen by the Contractor for General Construction Work must be approved by the Commissioner before the area is rented. All insurance maintenance and equipment required for trailer field office shall also apply to rented spaces.

H. ADDITIONAL EQUIPMENT FOR THE RESIDENT ENGINEER (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

1. The Contractor for General Construction Work shall supply photo equipment not to exceed \$250. Said equipment to be specified by Resident Engineer. At the completion of the project, the equipment shall become the property of the City of New York.
2. The Contractor for General Construction Work shall provide a copy machine for paper sizes 8½ x 11 & 8½ x 14. Copier shall remain at job site 30 days beyond the Substantial Completion date.
3. The Contractor for General Construction Work shall furnish a fax machine and a telephone answering machine at commencement of the project. All materials shall be new, sealed in manufacturer's original packaging and shall have manufacturers' warranties. All items shall remain the property of the City of New York at the completion of the project.
4. Computer Workstation (Refer to the Addendum to the General Conditions for the number of Computer Workstations to be provided):

Computers shall be provided for all contracts that have a total duration of 180 Consecutive Calendar Days (CCDs) or more, as set forth in Schedule "A". Contracts that have a total duration of less than 180 CCDs shall not require computers. Computer workstations shall be provided for

the duration of the contract.

(1) Personal Computer(s) - Workstation Configuration.

- (a) Make and Model: Dell, Gateway, Toshiba, HP, IBM, or an approved equal. (Note: an approved equal requires written approval of the Assistant Commissioner of ITS.)
- (b) Processor: 3.0 GHz Pentium 4 or faster computer - Single Processor.
- (c) System RAM: Minimum of 1 GB (Gigabytes) of SDRAM or DDR.
- (d) Hard Disk Drive(s): 80 GB (Gigabytes) or larger.
- (e) CD-RW: Internal CD-RW, 48x Speed or faster.
- (f) 16xDVD+/RW: DVD Burner (with double layer write capability) 16x Speed or faster
- (g) I/O Ports: Must have at least one (1) Serial Port one, (1) Parallel Port, 2 USB Ports. Serial Ports must consist of UART 16550 Chip or better.
- (h) Video Display Card: PCI Interface with a minimum of 64 MB of RAM.
- (i) Monitor: 17" TFT LCD monitor.
- (j) Available Exp. Slots: System as configured above shall have at least two (2) full size PCI Slots available.
- (k) Fax/Modem: Internal Fax/Modem 56 Kbps speed, featuring 3COM or US Robotics Chipset and supporting a minimum of V.92 and MNP5 compliant. Integrated 10/100/1000 Ethernet.
- (l) Other Peripherals: Optical scroll Mouse, 101 Key Keyboard, Mouse Pad and all necessary cables.
- (m) Software Requirements: Microsoft Windows XP Professional, Microsoft Office 2003 Professional, Microsoft Project 2002 Professional, Adobe Acrobat reader, Anti-Virus software package with one year updates subscription, Win Zip and Auto Cad 2008 LT.

(2) All field offices requiring computers shall be provided with the following:

- (a) One (1) broad-band internet service account. This account will be active for the life of the project.
- (b) One (1) 600 DPI HP Laser Jet Printer (twelve (12) pages per minute or faster) with one (1) Extra Paper Tray (Legal Size)
- (c) All necessary Cabling
- (d) Storage Boxes for and Blank CDs/DVDs
- (e) Printer Table
- (f) UPS/Surge Suppressor combo

(3) All Computer Hardware shall come with a three (3) year warranty for on-site repair or replacement. Additionally, and notwithstanding any terms of the warranty to the contrary, the Contractor is responsible for rectifying all computer problems or equipment failures within one (1) business day.

- (4) An adequate supply of blank CD's/DVD's, and paper and toner cartridges for the printer shall be provided by the Contractor, and shall be replenished by the Contractor as required by the Engineer.
- (5) It is the Contractor's responsibility to ensure that electrical service and phone connections are also available at all times; that is, the Field Office Computer(s) is to be powered and turned on twenty four (24) hours each day.

Broadband connectivity is preferred at each field office location. Please take into consideration that an extra phone line dedicated to the modem must be ordered as part of the contract unless Internet broadband connectivity, via Cable or DSL, is available at the planned field office location. Any questions regarding this policy should be directed to Raul Canabal, Assistant Commissioner of Information Technology Services at 718-391-1668.

I. PUBLIC TELEPHONE (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

1. The Contractor shall provide a public telephone located on the site, where directed, for the duration of the Contract.

J. HEAD PROTECTION (HARD HATS)

1. The Contractor shall provide a minimum of 10 standard protective helmets for the exclusive use of Department of Design and Construction personnel and their visitors. Helmets shall be turned over to the Resident Engineer and kept in the office of the Resident Engineer.
2. Upon completion of the project, the helmets shall become the property of the Contractor.

K. RODENT AND INSECT CONTROL

1. **DESCRIPTION** - The General Contractor shall provide all labor, materials, plant and equipment, and incidentals required to survey and monitor rodent activity and to control any infestation or outbreak of rodents, rats, mice, water beetles, roaches and fleas within the project area. Special attention should be paid to the following conditions or areas:
 - a. Wet areas within the project area, including all temporary structures.
 - b. All exterior and interior temporary toilet structures within the project area.
 - c. All Field Offices and shanties within the project area of all Contractors and the Department of Design and Construction (DDC).
 - d. Wherever there is evidence of food waste and/or discarded food or drink containers, in quantity, that would cause breeding of rodents or the insects herein specified.
 - e. Any other portion of the premises requiring such special attention.
2. **MATERIALS:** All materials shall be approved by the New York State Department of Environmental Conservation and comply with the New York City Health Code, OSHA and the laws, ordinances and regulations of State and Federal agencies pertaining to such chemical and/or materials.
3. **PERSONNEL:** All pest control personnel must be supervised by an exterminator licensed in categories 7A & 8.
4. **METHODS**

- a. Application and dosage of all materials shall be done in strict compliance with the manufacturer's recommendations.
- b. Under the Maintenance of Site item (section 1.42.L), any unsanitary conditions, such as uncollected garbage or debris, resulting from the General Contractor's activities which will provide food and shelter to the resident rodent population shall be corrected by the General Contractor immediately after notification of such condition by the Commissioner

5. RODENT CONTROL WORK

- a. In wetlands, woodlands and areas adjacent to a stream, special precautions must be taken to protect water quality and to ensure the safety of other wildlife. To prevent poisoned bait from entering streams, no poisoned bait shall be used in areas within seventy-five (75) feet of all streambanks. Live traps must be used in these seventy-five (75) foot buffer zone areas and within wetland and woodland areas.
- b. In areas outside the seventy-five (75) foot zone of protection adjacent to streams, and in areas outside wetlands and woodlands, tamper proof bait stations with poisoned bait shall be placed during the period of construction and any consumed or decomposed bait shall be replenished as directed.
- c. At least one month prior to initiation of the construction work, and periodically thereafter, live traps and/or rodenticide bait in tamper proof bait stations, as directed above, shall be placed at locations that are inaccessible to pets, human beings, children and other non-target species, particularly wildlife (for example birds) in the project area.
- d. The General Contractor shall be responsible for collecting and disposing of all trapped and poisoned rodents found in live traps and tamper proof bait stations. The General Contractor shall also be responsible for posting and maintaining signs announcing the baiting of each particular location.

The General Contractor, under his/her Maintenance of Site operations, shall be responsible for the immediate collection and disposal of any visible rodent remains found on streets or sidewalks within the project area.

- e. It is anticipated that public complaints will be addressed to the Commissioner. The General Contractor, where directed by the Commissioner, shall take appropriate actions, like baiting, trapping, proofing, etc., to remedy the source of complaint within the next six (6) hours of normal working time which is defined herein for the purposes of this section as 7 A.M. to 6 P.M. on Mondays through Saturdays.
- f. Emergency service during the regular workday hours (Monday through Friday) shall be rendered within 24 hours, if requested by the Commissioner, at no additional cost to the City.

6. EDUCATION & TRAINING

- a. The General Contractor shall post notices on all Construction Bulletin Boards advising workers, employees, and residents to call the Engineer's Field Office to report any infestation or outbreak of rodents, rats, mice, water beetles, roaches and fleas within the project area. The General Contractor shall provide and distribute literature pertaining to IPM techniques of rodent control to affected businesses and superintendents of nearby residential buildings to ensure their participation in maintaining their establishments free of unsanitary conditions, harborage removal and rodent proofing.
- b. Prior to application of any chemicals, the General Contractor shall furnish to the Commissioner copies or sample labels for each pesticide, antidote information, and Material Data Safety Sheets (MSDS) for each chemical used.

7. RECORDS AND REPORTS

- a. The General Contractor shall keep a record of all rodent and waterbug infestation surveys conducted by him/her and make available, upon request, to the Commissioner. The findings of each survey shall include, but not be limited to, recommended Integrated Pest Management (IPM) techniques, like baiting, trapping, proofing, etc., proposed for rodent and waterbug pest control.
- b. The General Contractor shall maintain records of all locations baited along with the type and quantity of rodenticide and insecticide bait used.

L. SITE SECURITY/PERIMETER SIGNAGE

1. In order to properly convey notice to persons entering upon a City construction site, the Contractor shall furnish and install a sign at the entrance (gates) as follows:

NO TRESPASSING

AUTHORIZED PERSONNEL ONLY

2. If no-construction fence exists at the site, this notice shall be conveyed by incorporating the above language into safety materials (barriers, tape, and signs).

M. MAINTENANCE OF SITE AND ADJOINING PROPERTY

1. Take over and maintain the site, after order to start work.
2. Until the work of the Contract is completed and accepted, the Contractor shall be responsible for the safety of the adjoining property, including sidewalks, paving, fences, sewers, water, gas, electric and other mains, pipes and conduits etc. The Contractor shall, at its own expense, except as otherwise specified, protect same and maintain them in least as good a condition as that in which the Contractor finds them.
3. All pavements, sidewalks, roads and approaches to fire hydrants shall be kept clear at all times, maintained and repaired to serviceable condition with materials to match existing.
4. Provide and keep in good repair all bridging and decking necessary to maintain vehicular and pedestrian traffic.
5. The Contractor shall also remove all snow and ice as it accumulates on the sidewalks within the Contract Limits Lines.

N. SAFETY PRECAUTIONS FOR CONTROL CIRCUITS

1. Control circuits, the failure of which will cause a hazard to life and property, shall comply with the New York City Dept. of Buildings, Bureau of Electrical Control requirements.

O. OBSTRUCTIONS IN DRAINAGE LINES

1. The Contractor shall be responsible for all obstructions occurring in all drainage lines, fittings and fixtures after the installations and cleaning of these drainage lines, fittings and fixtures as certified by the Resident Engineer. Roof drains shall be kept clear of any and all debris. Any stoppage shall be repaired immediately at the expense of the Contractor for General Construction Work.

P. MAINTENANCE OF PROJECT SITE

1. Take over and maintain all project areas, after order to start work.
2. Until the work of the Contract is completed and accepted, the Contractor shall be responsible for the safety of all project areas, including water, gas, electric and other mains and pipes and conduits and shall at the Contractor's own expense, except as otherwise specified, protect same and maintain them in at least as good condition as that in which the Contractor finds them.
3. All pavements, sidewalks, roads and approaches to fire hydrants shall be kept clear at all times, maintained, and if damaged, repaired to serviceable conditions with materials to match existing.
4. The Contractor shall keep the space for the Resident Engineer in a clean condition.

Q. PROJECT SIGN AND RENDERING
PART A – PROJECT SIGN

1. Responsibility: The Contractor shall produce and install one (1) project sign which shall be posted and maintained upon the site of the project at a point and in a position where directed by the Commissioner. The Contractor shall protect the sign from damage during the continuance of work under the Contract and shall do all patching of lettering, painting and bracing thereof necessary to maintain same in first class condition and in proper position. Prior to fabrication, contractor shall submit an 8-1/2" x 11" color match print proof from the sign manufacturer of completed sign for approval by the Commissioner.
2. Sign Quality: The Contractor shall provide all materials required for the production of the sign as specified herein. Workmanship shall be of the best quality, free from defects and shall be produced in a timely manner.
3. Schedule: Upon project mobilization, the Contractor shall commence production and installation of the sign.
4. Removal: At the completion of all work under the Contract, the Contractor shall remove and dispose of the project sign away from the site.
5. Sign construction:
 - a. Frame: The frame shall be from quality dressed 2"x2" pine, fire retardant, pressure treated lumber, that surrounds the inside back edge of the sign. The sign shall have one (1) intermediate vertical and two (2) diagonal supports, glued and screwed for rigidity. Frame shall be painted white with two (2) coats of exterior enamel paint, prior to mounting of sign panel.
 - b. Edging: U-shaped, 22 gauge aluminum edging, with a white enameled finish to match sign background, shall run around entire edging of sign panel and frame. Corners shall be mitered for a tight fit. Channel dimensions shall be 1" inch (overlap to sign panel face) x 1 3/4" (or as required across frame depth) x 1" (back overlap).
 - c. Sign Panel: 4' x 8' panel shall be constructed in one (1) piece of 14 gauge (.0785") 6061-T6 aluminum. This panel shall be prefinished both sides with a glossy white baked-on enamel finish and be flush with edge of 2" x 2" wood frame. Samples must be submitted for approval.
 - d. Fastening: Fasten sign panel to wood frame using cadmium plated no. 8 sheet metal screws at 1/2" below edge of panel and 8" on center. The U-shaped aluminum channel shall be applied over the wood frame edge and fastened with cadmium plated no. 8 sheet metal screws at 12" on center around the entire perimeter.
6. Sign Graphics:
 - a. All visual components of the sign are in an Adobe *.pdf file, which is provided by the

Commissioner's representative. The file is to be opened in Acrobat Professional or Acrobat Approval in order to be saved with project information. The Commissioner's representative shall insert the project name and names and titles of personnel (3 or more) and any other required information associated with the project. At no point in the update, saving or renaming of the file should it be locked by any user. The digital file shall be provided by DDC to the Contractor (on a CD or via E-mail) for printing.

- b. The DDC *.pdf file with names provided by the commissioner shall be reproduced at the Sign Panel size of 4' x 8' on 3M High Performance Vinyl or approved equal. The sign manufacturer is required to print from the Acrobat *.pdf provided, and must match the following colors specified by Pantone: 3025 C, 119 C, 131 C, 1805 C, 1817 C in their exact locations as indicated in the *.pdf file, and on the DDC website: www.nyc.gov/buildnyc.
- c. Color shall be created in a four-color process to reproduce Pantone Colors (per Pantone formula).
 1. Pantone color 3025 C (C-100, M-17, Y-0, K-51).
 2. Pantone color 119 C (C-0, M-12, Y-100, K-49).
 3. Pantone color 131 C (C-0, M-32, Y-100, K-23).
 4. Pantone color 1805 C (C-0, M-91, Y-100, K-23).
 5. Pantone color 1817 C (C-0, M-90, Y-100, K-66).

The typeface, Helvetica shall be used in all text-fields as is specified in the settings of the Acrobat *.pdf.

Note: 3M High Performance Vinyl or equivalent shall be guaranteed for nine (9) years. Guarantee must cover fading, peeling, chipping or cracking.

PART B – PROJECT RENDERING (REFER TO THE ADDENDUM TO THE GENERAL CONDITIONS FOR THE APPLICABILITY OF THIS ARTICLE)

1. **Responsibility:** In addition to the Project Sign, the Contractor shall furnish and install one (1) sign showing a rendering of the project. From an approved image file provided by the DDC, the Project Rendering is to be sized, printed, and mounted in an identical manner as described in Part A above for the Project Sign. Any area of the 4' X 8' panel area not filled by the rendering shall be printed in Pantone color 3025 (c-100, M-17, y-0, K-51). A color match print proof from the sign manufacturer of the Rendering Sign printed from the supplied file is to be submitted to DDC for approval before fabrication. The Rendering Sign is to be posted at the same height as the Project Sign. Where possible, the Rendering Sign shall be mounted with a perfect match of the short sides of the rectangle so that the Rendering Sign and the Project Sign together will create one long rectangle.
2. **Removal:** At the completion of all work under the Contract, the Contractor shall remove and dispose of the project rendering away from the site.

R. PLANT PEST CONTROL REQUIREMENTS and TREE PROTECTION REQUIREMENTS

1. **Plant Pest Control Requirements:** The Contractor for General Construction Work (the "Contractor") and its subcontractors, including the Certified Arborist described below, shall comply with all Federal and New York State laws and regulations concerning Asian Longhorned Beetle (ALB) management, including protocols for ALB eradication and containment promulgated by the New York State Department of Agriculture and Markets (NYSDAM). The Contractor is referred to: (1) Part 139 of Title 1 NYCRR, Agriculture and Markets Law, Sections 18, 164 and 167, as amended, and (2) State Administrative Procedure Act, Section 202, as amended.

- a. All tree work performed within the quarantine areas must be performed by New York State Department of Agriculture and Markets (NYSDAM) certified entities. Transportation of all host material, living, dead, cut or fallen, inclusive of nursery stock, logs, green lumber, stumps, roots, branches and debris of a half inch or more in diameter from the quarantine areas is prohibited unless the Contractor or its sub contractor performing tree work has entered into a compliance agreement with NYSDAM. The terms of said compliance agreement shall be strictly complied with. Any host material so removed shall be delivered to a facility approved by NYSDAM. For the purpose of this contract host material shall be ALL species of trees.
 - b. Any host material that is infested with the Asian Longhorned Beetle must be immediately reported to NYSDAM for inspection and subsequent removal by either State or City contracts, at no cost to the Contractor.
 - c. Prior to commencement of tree work, the Contractor shall submit to the Commissioner a copy of a valid Asian Longhorned Beetle compliance agreement entered into with NYSDAM and the Contractor or its sub contractor performing tree work. If any host material is transported from the quarantine area the Contractor shall immediately provide the Commissioner with a copy of the New York State 'Statement of Origin and Disposition' and a copy of the receipt issued by the NYSDAM approved facility to which the host materials are transported.
 - d. Quarantine areas, for the purpose of this contract shall be defined as all five boroughs of the City of New York. In addition, prior to the start of any tree work, the Contractor shall contact the NYC Department of Parks & Recreation's Director of Landscape Management at (718) 699-6724, to determine the limits of any additional quarantine areas that may be in effect at the time when tree work is to be performed. The quarantine area may be expanded by Federal and State authorities at any time and the Contractor is required to abide by any revisions to the quarantine legislation while working on this contract. For further information please contact: NYSDAM (631) 288-1751.
2. **Tree Protection Requirements:** The Contractor shall retain a Certified Arborist, as defined by New York City Department of Parks and Recreation (NYCDPR) regulations, to provide the services described below.
- a. **Surveys and Reports:** The Certified Arborist shall, at the times indicated below, conduct a survey and prepare a plant material assessment report which includes: (1) identification, by species and pertinent measurements, of all plant material located on the project site, or in proximity to the project site, as described below, including all trees, significant shrubs and/or planting masses; (2) identification and plan for the containment of plant pests and pathogens, including the ALB, as described above; (3) evaluation of the general health and condition of any infected plant material.
 - b. **Frequency of Reports:** The Certified Arborist shall conduct a survey and provide a plant material assessment report at two (2) points in time: (1) prior to the commencement of construction work; and (2) at the time of substantial completion. In addition, for projects exceeding 24 months in duration, the Certified Arborist shall conduct a survey and prepare a report at the midpoint of construction. Copies of each plant material assessment report shall be submitted to the Resident Engineer within two (2) weeks of the survey.
 - c. **Proximity to Project Site:** Off-site trees, significant shrubs and/or planting masses shall be considered to be located in proximity to the project site under the circumstances described below.
 - 1. The tree trunk, significant shrub, or primary cluster of stems in a planting mass is within 50 (fifty) feet of the project's Contract Limit Lines (CLLs) or Property Lines (PLs).
 - 2. Any part of the tree or shrub stands within 50 (fifty) feet of: (a) a path for site access for vehicles and/or construction equipment; or (b) scaffolding to be erected for construction

activity, including façade remediation projects.

3. The Certified Arborist determines that the critical root zone (CRZ) of an off-site tree, significant shrub, or primary cluster of stems in a planting mass extends into the project site, whether or not that plant material is located within the 50-foot inclusionary perimeter as outlined above.

 - d. **Tree Protection Plan:** The Certified Arborist shall prepare, and the Contractor shall implement, a Tree Protection Plan, for all trees that may be affected by any construction work, excavation or demolition activities, including without limitation, (1) on-site trees, (2) street trees, as defined below, (3) trees under NYCDPR jurisdiction as determined by the Department of Transportation, and (4) all trees that are located in proximity to the project site, as defined above. The Tree Protection Plan shall comply with the NYC DPR rules, regulations and specifications. The Contractor is referred to Chapter 5 of Title 56 of the Official Compilation of the Rules of the City of New York. Copies of the Tree Protection Plan shall be submitted to the Resident Engineer prior to the commencement of construction. Implementation of the Tree Protection Plan for street trees and trees under NYCDPR jurisdiction shall be in addition to any tree protection requirements specified or required for the project site.
For the purpose of this article, a "street tree" means the following: (1) a tree that stands in a sidewalk, whether paved or unpaved, between the curb lines or lateral lines of a roadway and the adjacent property lines of the project site, or (2) a tree that stands in a sidewalk and is located within 50 feet of the intersection of the project's site's property line with the street frontage property line.
3. **No Separate Payment.** No separate payment shall be made for compliance with Plant Pest Control Requirements or Tree Protection Requirements. The cost of compliance with Plant Pest Control Requirements and Tree Protection Requirements shall be deemed included in the Contractor's bid for the Project.

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

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

Contract for Furnishing all Labor and Material Necessary

Contractor

Dated _____, 20____

Approved as to Form
Certified as to Legal Authority

Acting Corporation Counsel

Dated _____, 20____

Entered in the Comptroller's Office

First Assistant Bookkeeper

Dated _____, 20____

FMS ID: PV467ANYC



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

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

Contract for Furnishing all Labor and Material Necessary and Required for:

- CONTRACT NO. 1 GENERAL CONSTRUCTION WORK
- CONTRACT NO. 2 PLUMBING WORK
- CONTRACT NO. 3 HVAC + FIRE PROTECTION WORK
- CONTRACT NO. 4 ELECTRICAL WORK

Archstone Clinton Theater Fit-Out for the Alliance of Resident Theatres/ New York

LOCATION: 502 West 53rd Street
BOROUGH: New York, NY 10019
CITY OF NEW YORK

Chinatown Plumbing & Heating Inc.

Contractor

Dated August 7, 2014

Approved as to Form
Certified as to Legal Authority

Acting Corporation Counsel

Dated September 19, 2013

Entered in the Comptroller's Office

First Assistant Bookkeeper

Dated _____, 20____

JP
9-19-13



3-067



PROJECT ID: PV467ANYC

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

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

VOLUME 3 OF 3

ADDENDUM TO THE GENERAL
CONDITIONS

SPECIFICATIONS

FOR FURNISHING ALL LABOR AND MATERIALS
NECESSARY AND REQUIRED FOR:

Archstone Clinton Theater Fit-Out for
the Alliance of Resident Theatres/
New York

LOCATION: 502 West 53rd Street
BOROUGH: New York, NY 10019
CITY OF NEW YORK

CONTRACT NO. 1	GENERAL CONSTRUCTION WORK
<u>CONTRACT NO. 2</u>	<u>PLUMBING WORK</u>
CONTRACT NO. 3	HVAC + FIRE PROTECTION WORK
CONTRACT NO. 4	ELECTRICAL WORK

Department of Cultural Affairs

Toshiko Mori Architects

Date: June 20, 2013



13-067

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

ADDENDA CONTROL SHEET

BID OPENING DATE: November 14, 2013

PROJECT No. : PV467ANYC

TITLE: Archstone Clinton Theater Fit-Out for the Alliance of Resident
Theatres/New York

ADDENDA ISSUED	NO. OF DWG	DATE	APPROVED BY:	
			ARCHITECTURE/ ENGINEERING	GENERAL COUNSEL
#1 Revisions to the Addendum to the General Conditions		10/23/13	<i>[Signature]</i>	<i>[Signature]</i>

10-23-13

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

October 23, 2013

ADDENDUM No. # 1

FOR FURNISHING ALL LABOR AND MATERIAL NECESSARY AND REQUIRED FOR:

PV467ANYC

Archstone Clinton Theater Fit-Out for the Alliance of Resident Theatres/New York

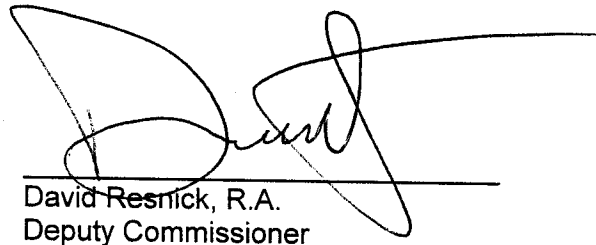
This addendum is issued for the purpose of amending the requirements of the Bid and Contract Documents and is hereby made a part of said Bid and Contract Documents to the same extent as though it were originally included therein.

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

1. **Revisions to the Addendum to the General Conditions:**
Delete page 8 and replace with revised page 8R.

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

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



David Resnick, R.A.
Deputy Commissioner

Name of Bidder

By: _____

SCHEDULE A (FOR PUBLICLY BID PROJECTS)

Relating to Article 22 - Insurance

PART I. Minimum Limits and Special Conditions

Insurance indicated by a blackened box (■) or by (X) in the to left will be required under this contract.

Types of Insurance (per Article 22 in its entirety, including listed paragraph)	Minimum Limits and Special Conditions
<p>■ Commercial General Liability Art. 22.1.1</p>	<p>\$ 2,000,000 per occurrence \$ 4,000,000 aggregate (applicable separately to this Project)</p> <p>Additional Insureds: 1. City of New York, including its officials and employees, and 2. The Alliance of Resident Theatres/New York A.R.T./New York 3. Department of Cultural Affairs 4. Dermot Clinton Green, LLC 5. AvalonBay Communities, Inc. 6. Weber-Farhat Realty Management, Inc. 7. Freddie Mac its Successors and Assigns c/o Wells Fargo Bank National Association</p>
<p>■ Workers' Compensation Art. 22.1.2</p> <p>■ Disability Benefits Insurance Art. 22.1.2</p> <p>■ Employers' Liability Art. 22.1.3</p> <p><input type="checkbox"/> Jones Act Art. 22.1.4</p> <p><input type="checkbox"/> U.S. Longshoremen's and Harbor Workers Compensation Act Art. 22.1.4</p>	<p>Workers' Compensation: Statutory per New York State law without regard to jurisdiction</p> <p>Disability Benefits Insurance: Statutory per New York State law without regard to jurisdiction</p> <p>Employers' Liability: \$1,000,000 each accident</p>
<p><input type="checkbox"/> Builders' Risk Art. 22.1.5</p> <p>■ Installation Floater</p>	<p>Applicable to Builders' Risk or Installation Floater:</p> <p>_____ 100 _____ % of total value of Work</p> <p>City of New York and the Contractor named as Loss Payee for the Work in order of precedence, as their interests may appear.</p> <p><u>Note:</u> Article 22.1.5 is revised by deleting the following sentence: "Such policy shall name as insureds the City, the Contractor, and its Subcontractors". This deletion applies to Builders' Risk and Installation Floater.</p>

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

October 23, 2013

ADDENDUM No. # 2

FOR FURNISHING ALL LABOR AND MATERIAL NECESSARY AND REQUIRED FOR:

PV467ANYC

Archstone Clinton Theater Fit-Out for the Alliance of Resident Theatres/New York

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

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

1. Revisions to the Bid Booklet:

Delete page 24 and replace with revised page 24R.

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

If additional information is required, please contact the Department of Design and Construction, Contract Section at (718) 391-2200, (718) 391-1283, or by fax at (718) 391-2615.



David Resnick, R.A.
Deputy Commissioner

Name of Bidder

By: _____

DESCRIPTION AND LOCATION OF WORK:

Archstone Clinton Theater Fit-Out for the Alliance of Resident Theatres/NY

502 West 53rd Street

New York, NY 10019

E-PIN: 85013B0121 / DDC PIN: 8502013PV0023C G.C; E-PIN: 85013B0122 / DDC PIN:

8502013PV0026C PLBG; E-PIN: 85013B0123 / DDC PIN: 8502013PV0024C HVAC; E-PIN:

85013B0124 / DDC PIN: 8502013PV0025C ELECTRICAL

DOCUMENTS AVAILABLE AT:

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

SUBMISSION OF BIDS BEFORE BID OPENING:

TIME TO SUBMIT:

On or Before: **THURSDAY, NOVEMBER 14, 2013**

BIDS MUST BE CLOCKED IN PRIOR TO BID OPENING

PLACE TO SUBMIT:

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

BID OPENING:

PLACE OF BID OPENING:	Department of Design and Construction Contract Section 30-30 Thomson Avenue – First Floor Long Island City, NY 11101
DATE AND HOUR:	THURSDAY, NOVEMBER 14, 2013 @ 2:00 pm
	LATE BIDS WILL NOT BE ACCEPTED

PRE-BID CONFERENCE:

PLACE	Archstone Clinton Theater 502 West 53 rd Street New York, NY 10019
DATE AND HOUR	THURSDAY, OCTOBER 24, 2013 AT 10:00AM
MANDATORY OR OPTIONAL	OPTIONAL

BID SECURITY:

Bid Security is required in the amount set forth below; provided, however, bid security is not required if the TOTAL BID PRICE set forth on the Bid Form is less than \$ 1,000,000.00.

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

PERFORMANCE AND PAYMENT SECURITY:

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

AGENCY CONTACT PERSON:

Lorraine Holley, 30-30 Thomson Avenue – First Floor, Long Island City, Queens, NY 11101
Telephone (718) 391-2200 or (718) 391-2601 Fax: (718) 391-2615

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

November 18, 2013

ADDENDUM No. # 3

FOR FURNISHING ALL LABOR AND MATERIAL NECESSARY AND REQUIRED FOR:

PV467ANYC

Archstone Clinton Theater Fit-Out for the Alliance of Resident Theatres/New York

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

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

1. **Revised Bid Opening Date:**
The Bid Opening for the Contract described below has been rescheduled to November 26, 2013, at 2:00pm.

Contract 1 – General Construction Work
Contract 2 – Plumbing Work
Contract 3 – HVAC Work
Contract 4 – Electrical Work
2. **Questions from Bidders and Responses to Questions:**
See Attachment A.
3. **Revisions to the Bid Booklet:**
See Attachment B.
3. **Revisions to the Addendum to the General Conditions:**
See Attachment C.
3. **Revisions to the Specifications:**
See Attachment D.
4. **Revisions to the Drawings:**
See Attachment E.

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

If additional information is required, please contact the Department of Design and Construction, Contract Section at (718) 391-2200, (718) 391-1283, or by fax at (718) 391-2615.



David Resnick, R.A.
Deputy Commissioner

Name of Bidder

By: _____

DDC PROJECT #: PV467ANYC

PROJECT NAME: Archstone Clinton Theater Fit-Out for the Alliance of Resident Theatres/New York

ATTACHMENT A - BIDDERS QUESTIONS AND DDC RESPONSES

No.	Bidders Questions	DDC Responses
1	Drawing Sheet A-402 calls for an International Building Code (IBC) compliant stair. The 63" diameter stair shown will not meet IBC code requirements, however. The grab rail as shown is 34", leaving only 25.25" of open tread path from the inside of the rail to the center column. The code calls for a minimum of 26". Please advise.	Provide for 63.75" overall diameter. See Attachment E, Revisions to the Drawings, for more information.
2	Are Stairs C and E as shown on Drawing Sheet A-402 identical?	Yes, Stairs C and E are identical.
3	There appears to be a conflict in what work is to be provided under the Electric Contract, #4. In Specification Section 260500, "Common Work Results for Electrical," Article 1.6 states that the work includes "Power and empty raceway systems" for Security, Telecommunications, and Audio Visual Systems. In the Bid Booklet of Volume 1, however, pp. 21-42 thru 21-44, the Bid Breakdown for Electrical Work includes line items for the Division 27 and 28 sections. Is the written specification, which calls for provisions for future equipment, cable and installations correct? Or, shall Bidders include the furnishing and installing of all Telecommunications, Backbones, AV Equipment, and Security Devices per the Bid Breakdown?	Bidders shall furnish and install this equipment. See Attachment D, Revisions to the Specifications, for further information.
4	As described in the Electric Contract (#4) Bid Breakdown, the line items for Specification Section 271323 "Telecommunications Optical Fiber Backbone Cabling" and Specification Section 271500, "Telecommunications Horizontal Cabling," call for the supply of an empty conduit system and stub-ups to accommodate audio video and electronic and security data. This is only shown on the Drawings for General Construction (Contract #1), and not on the drawings for Contract #4. How shall we proceed pricing this?	Elevations on Drawing Sheets A-500 thru A-524 show elevation locations for equipment in Contract #4-Electrical Work. See also Attachment D, Revisions to the Specifications, for further information.
5	In the Bid Breakdown for Contract #1 - General Construction, Specification Section 116191, "Performance Lighting Instruments and Accessories," shows the GC to purchase and install the theatrical projection screens and lighting instruments and accessories. Shall the Contractor for Electrical Work, Contract #4, provide a price to the GC for the theater lighting?	Per Bid Booklet, Contract #1 - General Construction will cover all work specified in Section 116191, "Performance Lighting Instruments and Accessories." Coordination between Contract #1 and Contract #4 should be considered, but direct pricing will not be necessary.

6	In reference to Drawing Sheet A -810, can you please provide further information for the Digital Signage?	The Digital signage shall be outdoor screens by Cyraq, 1000 Series - 46" 1080P Sunlight-Readable Outdoor Digital Display, or an approved equal.
7	In the Volume 1 Bid Booklet Bid Breakdown, Specification Section 057000, "Decorative Metal," has a line item for "Stainless Steel (SS) Side Panel at Janitor Closet/Laundry." On Drawing Sheet A-515, Elevations 5, 6, 7 and 8 show only a SS Transition Edge, however. No SS side panel is shown on the Finish Schedule, either. Please advise.	See Attachment B, Revisions to the Bid Booklet, and Attachment E, Revisions to the Drawings, for this information.
8	In the Volume 1 Bid Booklet Bid Breakdown, the line items for Specification Section 055100, "Metal Stairs", "Stair A - 31R" and "Stair B - 30R" are incorrect. Please revise.	See Attachment B, Revisions to the Bid Booklet, for this revision.
9	In the Volume 1 Bid Booklet Bid Breakdown, Specification Section 057000, "Decorative Metal" includes line items for "Perforated Metal Risers for Stairs A and B. However, Specification Section 055100, "Metal Stairs" include Metal Pan Stairs. Which is correct- metal pan risers or perforated?	Both are correct; the stairs shall be metal pan stairs with perforated metal risers. Refer to Specification 055100, "Metal Stairs."
10	In the Volume 1 Bid Booklet Bid Breakdown, the line items for Specification Section 057300, "Handrails and Railings," include Stainless Steel (SS) pipe handrails on SS brackets and SS handrails on SS posts. Drawing Sheet A-411, however, shows painted metal handrails on metal brackets. Please advise which is correct.	Drawing Sheet A-411 and Drawing Sheet A-600 Material Schedule is correct. See Attachment B, Revisions to the Bid Booklet, for further information.
11	In Specification Section 051200, "Structural Steel," Article 1.6 requires that products shall have a recycled content. What percent by weight must be recycled?	10% per USGBC LEED Commercial Interiors v2009 Materials and Resources Credit 4, Threshold 1.
12	In Specification Section 230900, "Instrumentation and Control for HVAC," Article 2.1A "Manufacturers" includes several acceptable manufacturers for temperature controls. However, 2.1B "Existing Control System Manufacturer" includes only one company, Distech Controls. Is Distech Controls the only manufacturer allowed to be used?	No. Any new work, which will not impact the existing system, may use any of the acceptable manufacturers listed in Article 2.1A in Specification Section 230900. Any work associated with the existing system, e.g., furnishing an auxiliary DI point as required, must take into account the existing control manufacturer. Refer to Drawing Sheet M-901, which shows how the new work connects to the existing control system that shall monitor the status of new FCUs.
13	In the Volume 1 Bid Booklet Bid Breakdown, Specification Section 064023 "Interior Architectural Woodwork" has a line item for a "partial height partition." Where is this shown on the Drawings?	This partition is shown on Drawing Sheet A-310, Detail 4.
14	Where are the "Fabric-Wrapped Wall Panels," per Specification Section 097723, shown on the Drawings?	Refer to the Material Schedule on Drawing Sheet A-600. See also Drawing Sheets A-519, Elevation 9 and A-525, Elevation 11.

5	Drawing Sheet A-601 calls for P-lam toilet partitions. In the Volume 1 Bid Booklet Bid Breakdown, Specification Section 102113, "Toilet Compartments," calls for Stainless Steel partitions. Specification 102113 Toilet Partitions gives information on solid plastic partitions. Of what material are the toilet partitions to be constructed?	See Attachment E, Revisions to the Drawings, for this information. Also see Attachment B, Revisions to the Bid Booklet and Specification Section 102113, "Toilet Partitions," for further information.
16	Drawing Sheet TE-131 shows various seating riser and stage layouts using equipment specified in Section 116123, "Performance Platforms." Are bidders to provide material for the sum of all layouts shown, or just the maximum amount of sections shown in "Arena Layout 4" plus the quantity shown on "End Stage Layout 3" for the 48" leg count?	Please provide the highest count of each based on the four layouts, plus two spares of each. See Attachment E, Revisions to the Drawings, for further information.
17	In Specification Section 116143 "Performance Draperies," Article 1.3A lists items to be provided as Alternates, though the Bid Booklet makes no mention of Alternate work. Please clarify.	This project has no Alternates. See Attachment D, Revisions to Specifications, for further information.
18	The Reflected Ceiling Plans and Finish Schedule on Drawing Sheet A-600 do not state the ceiling construction types. Certain cross sections and details, however, suggest gypsum ceilings throughout. Should bidders assume that all ceilings are to receive 5/8" gypsum and furring channel, over a black iron hanger system, unless otherwise noted?	Refer to Material Schedule on Drawing Sheet A-600, as well as Attachment E, Revisions to the Drawings, for ceiling type.
19	The Window Schedule per Drawing Sheet A-610 is cut off after the column titled "Reference DWG (Plan)." Please provide a complete window schedule.	See Attachment E, Revisions to the Drawings, for this information.
20	May one of the specified elevator manufacturers gain access to the site to review the elevator scope of work since it is a retrofit of existing equipment?	No. The pre-bid meeting was the only opportunity to visit the site.
21	In Addendum #1, Schedule A was revised to require a Commercial Liability Insurance of 4M/2M. Most policies carry a limit of 2M/1M, and do not offer a 4M/2M policy, however. Can the additional requirement be satisfied with an additional Umbrella Policy? For example, a 2M/1M policy will require a 2M additional Umbrella Policy.	Yes, this is acceptable. An Umbrella Policy that sits directly over the underlying CGL policy (i.e. provides the same coverage with no additional exclusions) may be used by a vendor to satisfy DDC's required minimum insurance policy limits that may otherwise exceed the existing policy limits contained in the vendor's underlying policy.
22	Are there any areas that require work to be done during overtime hours?	This will be discussed during Pre-Award.
23	Have the Fire Alarm Drawings been approved yet?	No, but the filing process has been started.
	Will the Engineer of Record sign and seal the As-Built Drawings for the Fire Alarm System?	Yes.

25	Is the existing Fire Alarm System approved by the FDNY?	Yes.
26	Please provide the contact information for the Fire Alarm vendor for the existing system.	The existing Fire Alarm system vendor contact information is as follows: Sol Ayoub, Director of Operations & Engineering High Rise Fire Protection Corp. Telephone: 718-369-3434 Fax: 718-369-0375 www.HighRisefire.com
27	Can you please specify the work hours when bidders can work in the garage area?	This will be discussed during Pre-Award.
28	Drawing Sheet A-600 calls for C-1 to have "½" Concrete Topping." Specification Section 035416, "Hydraulic Cement Underlayment," however, calls for ¼" underlayment. Please clarify which thickness of hydraulic cement is to be provided.	Specification Section 035416 is correct. See Attachment E, Revisions to the Drawings, further information.
29	In reference to Drawing Sheet A-903, what is the countertop material "SRF-X?"	See Attachment E, Revision to Drawings, for this information.
30	In reference to the Door Schedule on Drawing Sheet A-604, what is the door material designated as "IM?"	Refer to Drawing Sheet G-001 for this information.
31	Which Contract is to provide and install the radiator covers as shown on Drawing Sheet A-800?	Contract #1 for General Construction Work shall provide and install the radiators covers as shown on Drawing Sheet A-800. Refer to Specification 238233 'Convectors' for further information.
32	Which Contract is to provide and install the toilet fixtures per Fixture Schedule on Drawing Sheet A-601?	Contract #2 for Plumbing Work shall provide and install the toilet fixtures per Fixture Schedule on Drawing Sheet A-601. Refer to the Volume 1 Bid Booklet Bid Breakdown Section 224000 'Plumbing Fixtures.'
33	Drawing Sheet A-128 calls for a resiliently hung ceiling in Theatre 1, though cross sections of this room show a bare slab. Which is correct?	A resiliently hung plywood ceiling covers the area of Theater 1 East of Column Line "I". See note at top of page on Drawing Sheet A-128 for clarification.
34	Do Details 8 - 11 on Drawing Sheet A-800 apply to Theatre 1 as well as Theatre 2? If the details apply to both Theaters, is this work throughout Theatre 1 or only a portion?	Details 8 - 11 on Drawing Sheet A-800 apply to a portion of the ceiling of Theatre 1, and all of the ceiling at Theatre 2 per Drawing A-303. See RFI #33 above for further information.
35	Is black paint sufficient for the concrete ceiling finish in Theatre 1, or are bidders to provide an actual concrete stain?	Black paint is sufficient.
36	In reference to Drawing Sheet A-600, what is ceiling type "AC-2?"	Ceiling type "AC-2" is described in the Material Schedule on Drawing Sheet A-600. Refer to Specification Section 098436, "Sound Absorbing Ceiling Units," for further information.
37	On Drawing Sheet A-014, wall assemblies 1A, 7B, 13A, and 14A are marked with, "Add Wall-1 Assembly at Theatre Side." Does this mean that the Wall-1 Assembly (consisting of 2-1/2" metal furring, batt insulation and 2 layers of 5/8" GWB) is to be built in front of these complete wall types, in essence having two walls with an air gap between them?	No. Refer to Drawing Sheet A-015, Detail 16 for Wall-1 Assembly.

38	Per Drawing Sheet A-014, please provide further information as to where the note, "Add layer of 5/8" GWB as required to accommodate base" would apply for Partition Assemblies 7, 8, 10, 13, and 14.	For these assemblies, all areas with WD-4 base will require additional 5/8" GWB. See Drawing Sheet A-600 for further information.
39	Where and how does Note #1 regarding the "S" designation apply, per Drawing Sheet A-014?	The "S" designation is in wall type tags on plans. This designation is for code only, and does not affect actual construction type.
40	On Drawing Sheet A-612, the information in column "Image and Dimensions" is illegible. Please provide a clearer document.	See Attachment E, Revisions to the Drawings, for this information.
41	What is the weight of the pipe grid that the Unistrut (or equal) will be supporting?	Refer to Specification Section 116151, "Performance Pipe Grid," for this information.
42	Per Drawing Sheet A-800, can you specify the model of the 1/2" static deflection spring hanger at the Resiliently Hung Ceiling?	Provide Kinetics Super-compact Ceiling Hanger Model KSCH, or an approved equal. Refer to Specification Section 095425, "Wood Ceilings," for further information.
43	Per Drawing Sheet A-800, can you provide a detail of how the ceiling will be attached to the Unistrut (or equal) structure?	The ceiling will hang from building structure and not be attached to the Unistrut (or equal) structure.
44	The Addendum to the General Conditions, Volume 3 of the Contract Documents, Schedule E "Separation of Trades," calls for "Control Wiring - Plumbing", "Door Monitoring Systems - Control Wiring" and "Motor Starter and Motor controls for equipment requiring power wiring", to be furnished and installed under Contract 1 - General Construction. Can you identify where these items are located on the Bid Breakdown?	See page 21 of the Bid Booklet in Volume 1 for clarification on items within the Bid Breakdown. Also refer to Attachment C, Revisions to the Addendum to the General Conditions, Schedule E "Separation of Trades" for each Contractor's responsibility.
45	Per Drawing Sheet A-501, Elevation 1, please provide a detail and specification for the "Removable Fabric Protection Pads."	See Attachment D, Revisions to Specifications, for this information.
46	Please indicate which structural steel elements are to receive intumescent paint. Please also provide a fire resistance rating to be met.	See Drawing A-400, Section 06 for this information. Also see Attachment E, Revisions to Drawings.

DC PROJECT #: PV467ANYC

PROJECT NAME: Archstone Clinton Theater Fit-Out for the Alliance of Resident Theatres/New York

ATTACHMENT B – REVISIONS TO THE BID BOOKLET

The following Bid Breakdown line items are revised as follows:

1. 055100 Metal Stairs, page 21-7:
 - Stair A – delete “31R” and replace with “29R”
 - Stair B – delete “30R” and replace with “31R”

2. 057000 Decorative Metal, page 21-7:
 - Delete “SS side panel – janitor closet/ laundry”

3. 057300 Handrails and Railings, page 21-8:

Replace identification of hand railing and railing post with the following under Stair A and Stair B:

 - Painted metal single pipe hand railing on painted metal bracket
 - Painted metal pipe railing on 1 ½” painted metal handrail post with ss cable infill panels

4. 093100 Ceramic Tiling, page 21-19:
 - Add “Janitor’s Closet/ Laundry” under “Waterproofing”

5. 102113 Toilet Compartments, page 21-22:
 - Remove “S.S.” designation from all items

DC PROJECT #: PV467ANYC

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ATTACHMENT C – REVISIONS TO THE ADDENDUM TO THE GENERAL CONDITIONS

Revise Schedule E, "Separation of Trades," pages 26-27 as follows:

ITEM	Contract #1	Contract #2	Contract #3	Contract #4	Notes
Control Wiring – Plumbing		P			
Door Monitoring Systems – Control Wiring				P	
Motor starters and motor controls for equipment requiring power wiring			P		

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ATTACHMENT D – REVISIONS TO THE SPECIFICATIONS

1. Specification Section 097200 - Wall Coverings

Under Section 1.1 Summary A. Work Included, add

2. Protective Elevator Pads

Under Part 2 – Products, add

Section "2.3 Elevator Pads and Accessories"

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Palmer Pads
 - 2. American Floor Mats
 - 3. M&K Elevator Pads
 - 4. Approved Equal
- B. General: Provide rugged canvas elevator pads.
 - 1. Dimensions: 7'-8" width by 9'-2" height
 - 2. Hardware: Reinforced Grommets
 - 3. Coordinate with hanging accessories
- C. Accessories: Provide Self-Tapping Stud
 - 1. Material: Stainless Steel

2. Specification Section 102113 – Toilet Compartments:

Delete Articles 2.1- 2.5 and replace with the following text:

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements available manufacturers offering products that maybe incorporate into the Work include but are not limited to, the following:
 - 1. Thrislington Cubicles
 - 2. Prospec US
 - 3. Bobrick
 - 4. Approved Equal

2.2 MATERIALS

- A. Solid-Core, Phenolic Plastic Panels: Solid phenolic core with colored melamine face sheet on both sides, fused to substrate without visible glue line or seam. Provide units with eased edges and with minimum 12mm thick doors and pilasters, panels and screens.
 - 1. Edge Color: Black.
 - 2. Exposed Edges: Bull-nosed with radius corners.
- B. Melamine Facer Sheets: Thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
- C. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below.
 - 1. Sheet and Plate: ASTM B 209.
 - 2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221.
 - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 - 4. Welding Rods and Bare Electrodes: AWS A5.10.
 - 5. Castings: ASTM B 26/B 26M, alloy A356-T6.
- D. Sealant: One-part silicone sealant having a joint movement capability of plus-or-minus 50% elongation, and Shore A durometer hardness of 30.

2.3 PHENOLIC-CORE UNITS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Thrislington Cubicles Icon Leisure model
- B. Toilet-Enclosure Style: Floor-anchored.
- C. Overhead Stabilizing Rail: Extruded aluminum connected to front pilaster panels, integral doorstop, and divider panels. Provide with solid aluminum rail end brackets.
1. Finish: Anodized.
- C. Floor Support Legs: Extruded aluminum. Adjustable height with friction fit aluminum clamp attached to bottom edges of panels.
1. Finish: Anodized.
- D. Hardware: As indicated below with clear anodized finish to match stabilizing rail and support legs.
1. Hinges: Aluminum and nylon spring-type hinges, adjustable; provide 2 per door. Provide through-bolted fasteners with nylon grommets and aluminum rosettes exposed on the exterior of the compartments.
 2. Hinge Return Angle: Provide return angle connecting the hinge to both the front pilaster panels and divider panels. Angles shall be adhesive attached and thru-bolted with rosette.
 3. Rosettes: Solid aluminum.
 4. Door Latch: Manufacturer's standard heavy-duty nylon bolt type locking device with external occupancy indicator and emergency release.
 5. Bumpers: Black rubber.
 6. Door Stop: Manufacturer's standard design with integral stop; provide one for each cubicle.
 7. Fasteners: Stainless steel; concealed.
- E. Wall Brackets: Extruded aluminum.
1. Finish: Anodized.
- F. Fasteners and Anchors: Stainless steel anchors with nylon grommets and aluminum fasteners with theft-resistant-type heads. Provide bolt type for through-bolt applications with external aluminum rosette.
- G. Urinal-Screen Construction:
1. Flat-Panel Urinal Screen: Matching panel construction

2.4 FABRICATION

- A. General: Fabricate doors, panels, pilasters, and screens for compartment panel system.
- B. Compartment Panels and Screens: Laminate melamine facing sheets to full-sized phenolic core material in a single sheet, without joints or splices.
- C. Overhead-Braced-and-Floor-Supported Compartment System: Provide manufacturer's standard supports and leveling mechanism compartment panels to suit floor conditions. Install stabilizing rail and brackets to top of compartment panels.
- D. Doors: Provide swinging doors for compartments. Provide units with clear door opening dimensions required for compartments indicated to be ADA compliant.

- E. Wall-Hung Screens: Provide units in sizes indicated of same construction and finish as compartment panels. Provide screens with angle brackets and through-bolt fastening.

2.5 ALUMINUM FINISHES

- A. Anodic Finish: Anodized, etched medium matte, clear coating, 0.025mm nominal thickness.

3. Specification Section 116143 – Performance Draperies and Rigging Accessories:

Article 1.3A5-8: remove "(ADD/ALT G1)"
 Article 1.3A13: remove "(ADD/ALT A)"
 Article 1.3A14: remove "(ADD/ ALT F)"

4. Specification Section 260500 – Common Work Results for Electrical

Delete Article 1.6A10-13, and replace with the following text:

10. Security system, including infrastructure, wiring and equipment (refer to Security Consultant's drawings and specifications).
11. Telecommunication systems, including infrastructure, wiring, and equipment (refer to Telecommunication drawings and specifications).
12. Audio Visual systems, including infrastructure, wiring and equipment components (Refer to Audio Visual drawings and specifications).
13. Theatre equipment electrical infrastructure and wiring, including performance lighting (Refer to Theatre Consultant's drawings and specifications).

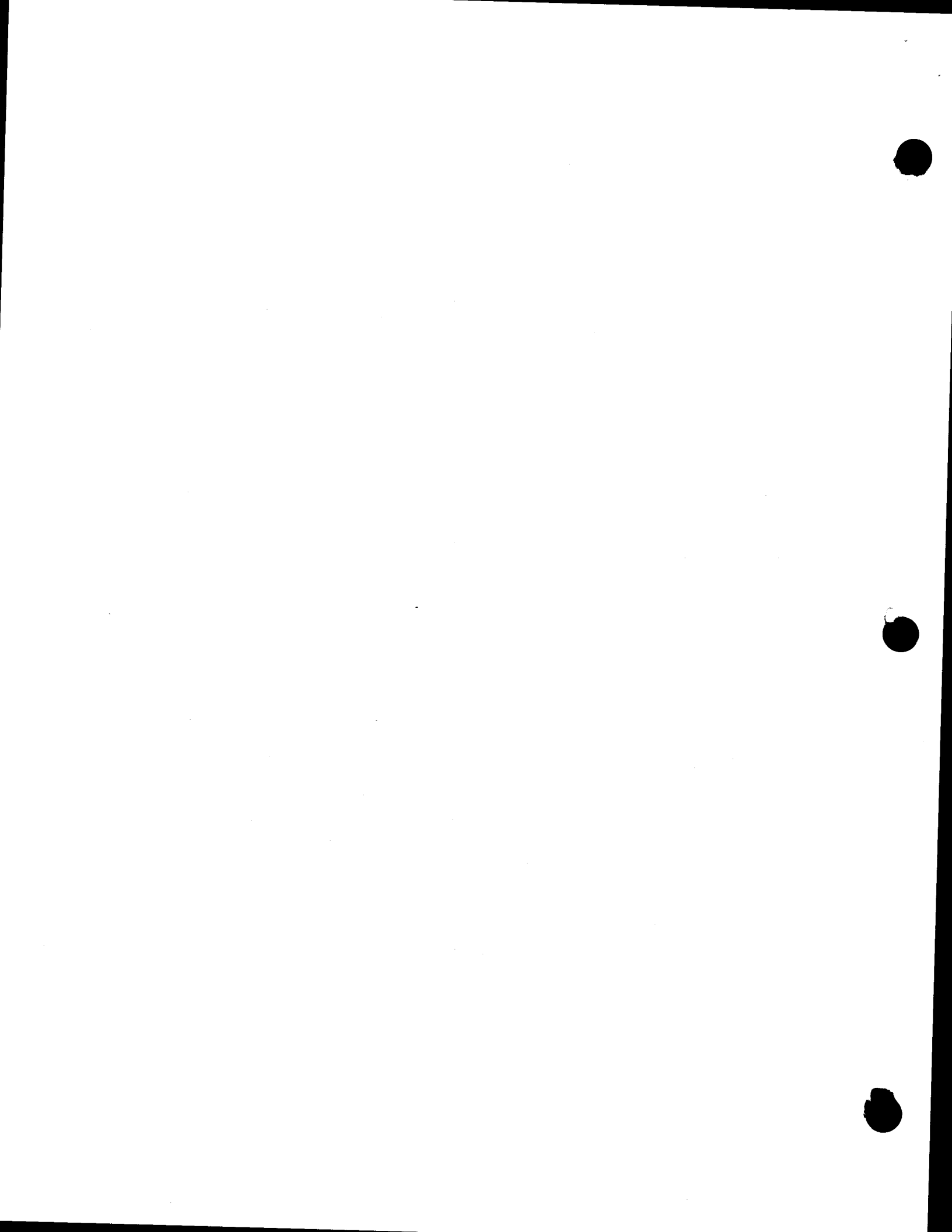
5. Specification Section 274116 – Audio and Audiovisual Systems:

Remove the following items from Article 3.8 Schedule of Equipment, "H1 Projector Package," p.22:

2	Projector lamp	Panasonic	ET LAD310W Lamp - PT-DZ8700U	
1	Projector case	Panasonic	Padded storage case for PT-DZ6700U	
2	Projector lamp	Panasonic	Lamp - PT-DZ6700U	

Remove the following items from Article 3.8 Schedule of Equipment, "H2 Projector Package," page 25:

1	Projector case	Panasonic	Padded storage case for PT-DZ6700U	
2	Projector lamp	Panasonic	Lamp - PT-DZ6700U	



DC PROJECT #: PV467ANYC

PROJECT NAME: Archstone Clinton Theater Fit-Out for the Alliance of Resident Theatres/New York

ATTACHMENT E – REVISIONS TO THE DRAWINGS

1. REFER TO DRAWING A-400 STAIR DETAILS:

Include the following text:

- NOTE: INTUMESCENT PAINT TO BE PROVIDED FOR ALL EXPOSED STRUCTURE AT STORAGE 03A AND 03B

2. REFER TO DRAWING A-402 STAIR C AND E:

- Revise overall diameter of Stairs C and E in Enlarged Plans 01, 02, 03, 04 to 63.75"

3. REFER TO DRAWING A-515 MEZZ FL LOWER JANITOR CL/OFFICE:

Detail 7 "JANITOR'S CL/ LAUNDRY M12 – SOUTH ELEVATION":

- Delete note "Stainless Steel Transition Edge"

4. REFER TO DRAWING A-600 SCHEDULES:

Revise Material Schedule as follows:

- Delete thickness designation from C-1 Concrete Topping
- Add SRF-X as follows:

MARK	MATERIAL	BASIS OF DESIGN MANUFACTURER	COLOR	FINISH	NOTES
SRF-X	ENGINEERED STONE COUNTERTOP	STONE SOURCE TREND-Q	655ITE STAR		

Revise Finish Schedule as follows:

- Under "CEILING" column, revise "PT-2" to "PT-2/ GWB-3"
- Under "CEILING" column, revise "PT-3" to "PT-3/ GWB-3"

5. REFER TO DRAWING A-601 SCHEDULES:

Revise Bathroom Accessory Schedule, under Mark "TP" Description "Toilet Partitions", as follows:

- Revise "Manufacturer and Model Number" to "Thrislington Cubicles Icon Leisure (or equal)"
- Revise "Finish" to "Alum Frame with Plastic Laminate Panels"

6. REFER TO DRAWING A-610.00 WINDOW SCHEDULE AND WINDOW DETAILS:

See Window Schedule, attached to this Addendum.

7. REFER TO DRAWING A-612.00 SIGN SCHEDULE:

See Sign Schedule, attached to this Addendum.

8. REFER TO DRAWING TE-111 THEATER EQUIPMENT THEATER 1 LOWER LEVEL PLAN:

Include the following text:

- NOTE: CURTAIN TRACK FROM HEAVY-DUTY CHANNEL TYPE TRACK CONSTRUCTED OF 14-GAUGE STEEL FORMED TO PROVIDE PARALLEL DOUBLE TRACKS FOR CARRIER WHEELS. TRACK SHALL BE TOTALLY ENCLOSED EXCEPT FOR THE BOTTOMCARRIER SLOT. PROVIDE IN BLACK FINISH.

9. REFER TO DRAWING TE-131 THEATER EQUIPMENT THEATER 1 PLATFORM LAYOUTS:

Include the following text for Details 1- THRUST LAYOUT, PLAN, 2 – FLAT FLOOR, PLAN, 3 – END STAGE LAYOUT, PLAN and 4 – ARENA LAYOUT – 150; PLAN:

- NOTE: PROVIDE 2 SPARES OF EACH PART LISTED ABOVE.

10. REFER TO DRAWING TE-132 THEATER EQUIPMENT THEATER 2 PLATFORM LAYOUTS:

Include the following text for Detail 1- END STAGE LAYOUT, PLAN:

- NOTE: PROVIDE 2 SPARES OF EACH PART LISTED ABOVE.



SIGN KEY

SIGN	IMAGE AND DIMENSIONS
A	<p>FLOOR MEZZ</p> <p>3/8"</p> <p>1-1"</p> <p>INSTALLATION HEIGHT BO TACTILE SIGN</p>
B	<p>DIRECTORY</p> <p>SECOND FLOOR THEATER BOX RESTROOM</p> <p>MEZZANINE FLOOR THEATER OFFICE ARTIST OFFICE PANTY MAY RESTROOM</p> <p>GROUND FLOOR INFORMATION DESK</p> <p>1-7"</p> <p>1-1"</p> <p>INSTALLATION HEIGHT BO TACTILE SIGN</p>
C	<p>6"</p> <p>6"</p> <p>3"</p> <p>WOMEN RESTROOM</p> <p>MEN RESTROOM</p> <p>INSTALLATION HEIGHT BO TACTILE SIGN</p>
D	<p>1-5"</p> <p>7"</p> <p>STAIR 6</p> <p>INSTALLATION HEIGHT BO TACTILE SIGN</p>
E	<p>3/8"</p> <p>7 1/4"</p> <p>JO THEATER</p> <p>INSTALLATION HEIGHT BO TACTILE SIGN</p>
F	<p>1-5"</p> <p>7"</p> <p>ASSISTIVE LISTENING DEVICES ARE AVAILABLE</p> <p>INSTALLATION HEIGHT BO TACTILE SIGN</p>
G	<p>1-4"</p> <p>1-4"</p> <p>OCCUPANCY BY MORE THAN 199 PERSONS IS DANGEROUS AND UNLAWFUL</p> <p>Certified of Operation No. Commissioner Dept. of Buildings, City of New York</p> <p>INSTALLATION HEIGHT BO TACTILE SIGN</p>
H	<p>6"</p> <p>3"</p> <p>INSTALLATION HEIGHT BO TACTILE SIGN</p>

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REVISIONS:

NUMBER	DESCRIPTION	DATE
1	100% SCHEMATIC DESIGN	09-15-2010
2	100% DESIGN DEVELOPMENT	03-18-2011
3	75% CONSTRUCTION DOCUMENTS	09-30-2011
4	100% CONSTRUCTION DOCS	02-27-2012
5	BD DOCUMENTS	4-13-2013



DIVISION OF STRUCTURES

CAPITAL PROJECT NUMBER:
PV467ANYC

PROJECT:
Archstone Clinton Theater Fit-Out
500 West 53rd Street
New York, NY 10019
FOR THE:
A.R.T./NY

DRAWING TITLE:
SIGN SCHEDULE

SCALE: 1" = 1'-0"

DATE: 13 APRIL 2013

PROJECT NO: PV467ANYC

DESIGNED BY:

CHECKED BY:

DRAWING NUMBER:
A-612.00

CADD FILE NO:

WINDOW SCHEDULE

WINDOW TAG	ROOM NAME	DESCRIPTION	GLAZING TYPE	F.O. HEIGHT	F.O. WIDTH	FRAME/HARDWARE FINISH	WINDOW TREATMENT	REFERENCE DWG (PLAN)	REFERENCE DWG (SECTION)
001	THEATER ONE								01/A-802 SIM NOTE: REMOVE ACOUSTICAL WINDOW FROM DETAIL
002	THEATER ONE							03/A-802	
003	THEATER ONE								01/A-802
004	THEATER ONE								
005	THEATER ONE								
006	THEATER ONE								
007	THEATER ONE								
008	THEATER ONE								
009	THEATER ONE								
010	THEATER ONE								
011	THEATER ONE								
012	THEATER ONE								
013	THEATER ONE								
014	THEATER ONE								
015	THEATER ONE								
016	THEATER ONE								
017	THEATER ONE								
018	THEATER ONE								
019	CONTROL BOOTH 1M/3	ALUMINUM HORIZONTAL ROLLING INTERIOR GLAZING SYSTEM	G-5	SEE ELEV/V/F	SEE ELEV/V/F	KYNAR, MATTE BLACK	DOUBLE ROLLER-SHADE -BLACKOUT SHADE W/ BLACKOUT CHANNELS -TRANSLUCENT SHADE TOWARD INTERIOR	03/A-802	01/A-802
020	CONTROL BOOTH 2U2	ALUMINUM HORIZONTAL ROLLING INTERIOR GLAZING SYSTEM	G-5	SEE ELEV/V/F	SEE ELEV/V/F	KYNAR, MATTE BLACK	DOUBLE ROLLER-SHADE -BLACKOUT SHADE W/ BLACKOUT CHANNELS -TRANSLUCENT SHADE TOWARD INTERIOR	03/A-802	02/A-811
021	CONTROL BOOTH 2U2	ALUMINUM HORIZONTAL ROLLING INTERIOR GLAZING SYSTEM	G-5	SEE ELEV/V/F	SEE ELEV/V/F	KYNAR, MATTE BLACK	DOUBLE ROLLER-SHADE -BLACKOUT SHADE W/ BLACKOUT CHANNELS -TRANSLUCENT SHADE TOWARD INTERIOR	03/A-802	02/A-811
022	THEATER ONE	ALUMINUM HORIZONTAL ROLLING INTERIOR GLAZING SYSTEM	G-5	SEE ELEV/V/F	SEE ELEV/V/F	KYNAR, MATTE WHITE	DOUBLE ROLLER-SHADE -BLACKOUT SHADE W/ BLACKOUT CHANNELS -TRANSLUCENT SHADE TOWARD INTERIOR	03/A-802	02/A-811
023	THEATER ONE	ALUMINUM OPERABLE SOUND-PROOFING INTERIOR GLAZING SYSTEM	G-2	SEE ELEV/V/F	SEE ELEV/V/F	KYNAR, MATTE BLACK	DOUBLE ROLLER-SHADE -BLACKOUT SHADE W/ BLACKOUT CHANNELS -TRANSLUCENT SHADE TOWARD INTERIOR	03/A-802	01/A-802 SIM NOTE: REMOVE ACOUSTICAL WINDOW FROM DETAIL
024	THEATER ONE								
025	THEATER ONE								
026	THEATER ONE								
027	THEATER ONE								
028	THEATER ONE								
029	CORRIDOR 1M/5	ALUMINUM CASEMENT WINDOW	G-3	SEE ELEV/V/F	SEE ELEV/V/F		SINGLE ROLLER SHADE, TO MATCH OTHERS IN LOBBY		03/A-811

NOTE: ALL WINDOWS @ LOBBY AREAS TO HAVE MANUALLY OPERATED TRANSLUCENT SHADES

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NUMBER	DESCRIPTION	DATE
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DBE
NEW YORK CITY DEPARTMENT OF
DESIGN + CONSTRUCTION

DIVISION OF STRUCTURES
CAPITAL PROJECT NUMBER:
PV467ANVC

PROJECT:
Archstone Clinton Theater Fit-Out
500 West 63rd Street
New York, NY 10019
FOR THE:
A.R.T./NY

DRAWING TITLE:
WINDOW SCHEDULE

SCALE: AS NOTED	DATE: 6 OCTOBER 2012
SEAL & SIGNATURE	PROJECT NO: PV467ANVC
	DRAWN BY:
	CHECKED BY:
	DRAWING NUMBER: A-610.00
	CADD FILE NO:

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

ADDENDUM TO THE GENERAL CONDITIONS

The General Conditions are hereby amended in accordance
with the terms and conditions set forth in this Addendum.

I. PROJECT DESCRIPTION

FMS #: PV467ANYC

PROJECT NAME: Archstone Clinton Theater Fit-Out for the Alliance of Resident Theaters/ New York

PROJECT DESCRIPTION: This Project consists of the fit-out of approximately 15,000 SF of existing raw space on the ground, mezzanine and second floors of the Archstone Clinton building with two 99-seat rental theatre spaces and ancillary programs including dressing rooms, prop shops, storage, control booths and offices. The existing Archstone Clinton building was completed in 2008 by Fox Fowle and is LEED Certified. Archstone Clinton provides approximately 50,000 SF of cultural space to be shared by three theatre companies – 52nd Street Theatre, A.R.T./New York and MCC Theatres.

PROJECT LOCATION: 500 West 53rd Street
BOROUGH: Manhattan
CITY OF NEW YORK
ZIP CODE: 10019
COMMUNITY BOARD #: 4

PROJECT MANAGEMENT:

- DDC shall publicly bid and enter into all contracts for the Project. DDC shall manage the Project using its own personnel.
- DDC shall publicly bid and enter into all contracts for the Project. A Construction Management firm (the "CM") hired by DDC shall manage the Project. The Contractor is advised that the CM shall serve as the representative of the Commissioner at the site and shall, subject to review by the Commissioner, be responsible for the inspection, management, coordination and administration of the required construction work, as delineated in the article of the Standard Construction Contract (April 2006) entitled "The Resident Engineer".
- DDC has entered into CM/Build Contract for the Project. The CM/Build Contractor shall be responsible for conducting a competitive bid process and entering into all contracts for the Project.

II. CM / BUILD CONTRACT: REVISIONS TO THE GENERAL CONDITIONS

"NOT USED"

III. CONTRACTS FOR THE PROJECT

The separate Contracts pertaining to this Project are set forth below:

- Contract No. 1 - Contract for General Construction Work
- Contract No. 2 – Contract for Plumbing Work
- Contract No. 3 – Contract for Heating, Ventilating, and Air Conditioning and Fire Safety Work
- Contract No. 4 – Contract for Electrical Work

IV. SCHEDULES

The Contractor is advised that Schedules A through F are attached to, and incorporated as part of, this Addendum to the General Conditions. These schedules contain important information that is specific to this Project. The Contractor is advised to carefully review these schedules.

V. APPLICABILITY OF ARTICLES AND AMENDED ARTICLES

The Contractor is advised that various Articles in the General Conditions may not apply to this Project or may apply as amended. Such Articles advise the Contractor to "Refer to the Addendum to the General Conditions for the applicability of this Article." Such Articles are set forth below. A check mark indicates whether the Article (1) applies to the Project, (2) does not apply to the Project, or (3) applies to the Project as amended. If no box is checked, the Article, as set forth in the General Conditions, applies to the Project. Amended Articles, if any, are set forth following this list of Articles.

<u>Article No.</u>	<u>Article</u>	<u>Sub-Article or PART</u> (if applicable)	<u>Applies</u>	<u>Does not Apply</u>	<u>Applies as Amended</u>
1.04	Contract Drawings	C) PRINTS	x		
1.05	Shop Drawings and Record Drawings	B) INTEGRATED DRAWINGS	x		
1.09	Surveys		x		
1.13	Sleeves and Hangers		x		
1.15	Temporary Heat		x		
1.20	Progress Photographs		x		
1.26	Security Guards/Fire Guards on the Site		x		
1.29	Sleeve and Penetration Drawings		x		
1.30	Location of Partitions		x		
1.34	Temporary Services	PART A			x
		PART B		x	
1.35	Temporary Use, Operation and Maintenance of Elevators during Construction	PART A – For New Buildings Up to 15 Stories		x	
		PART B – For New Buildings Over 15 Stories		x	

<u>Article No.</u>	<u>Article</u>	<u>Sub-Article or PART</u> (if applicable)	<u>Applies</u>	<u>Does not Apply</u>	<u>Applies as Amended</u>
		PART C – Existing Building	x		
1.36	General Mechanical Requirements		x		
1.37	General Electrical Requirements	PART B – Section A) Temporary Lighting	x		
		PART B – Section B) Site Security Lighting (New Construction)		x	
		PART D – Electrical Conduit System Including Boxes	x		
		PART E – Electrical Wiring Devices	x		
		PART F – Electrical Conductors and Terminators	x		
		PART G – Circuit Protective Devices	x		
		PART H – Distribution Centers	x		
		PART I – Motors	x		
		PART J – Motor Control Equipment	x		
1.40	Separation Between Trades		x		
1.42	Specific Requirements	C) BORINGS		x	
		E) WORK FENCE ENCLOSURE	x		
		G) RESIDENT ENGINEER'S OFFICE			
		1. OFFICE SPACE IN EXISTING BUILDING	x		
		2. TRAILER OFFICE		x	
		H) ADDITIONAL EQUIPMENT FOR THE RESIDENT ENGINEER			x
		I) 1. PUBLIC TELEPHONE		x	
		Q) PROJECT SIGN AND RENDERING			
		PART B – PROJECT RENDERING		x	

COMPUTER WORKSTATIONS

H) Number of Computer Workstations to be provided as outlined in Article 1.42 H, item 4:

1

AMENDED ARTICLES

The Contractor is advised that the amended Articles set forth below are included in the General Conditions and apply to the Project.

1.34 TEMPORARY SERVICES, PART A:

Delete A1 and A2, and add the following text:

"Plumbing Contractor shall provide temporary water from the existing building, including all access and distribution as required for work of all contracts. Remove and restore existing services when temporary water is no longer required and/or when permanent service is in place."

1.42 H ADDITIONAL EQUIPMENT FOR THE RESIDENT ENGINEER:

Add the following text:

"5. Include Scanner – Multifunction inkjet 4-in-1 network device prints photos, and documents, copies, scans, and faxes up to ledger-size paper. Brother MFC-6490CW Wireless All-in-One Inkjet Printer or approved equal."

VI. ADDITIONAL ARTICLES

Not Used

VII. SPECIAL EXPERIENCE REQUIREMENTS FOR THE PROJECT

- (1) **GENERAL:** Special Experience Requirements applicable to the contractor or subcontractor that will perform specific areas of work are set forth below.
- (2) **REVISION OF SPECIFICATIONS AND DRAWINGS:** In the event the Specifications and/or the Contract Drawings contain any Special Experience Requirement that is not set forth below, such Special Experience Requirement is deemed deleted, except as otherwise expressly provided in Section VIII of this Addendum.
- (3) **SPECIAL EXPERIENCE REQUIREMENTS FOR SPECIFIC AREAS OF WORK:** The special experience requirements set forth below apply to the contractor or subcontractor that will perform specific areas of work. Compliance with such experience requirements will be evaluated after an award of contract. Within two (2) weeks of such award, the contractor will be required to submit the qualifications of the contractor or subcontractor that will perform these specific areas of work. If the contractor intends to perform these specific areas of work with its own forces, it must demonstrate compliance with the special experience requirements. If the contractor intends to subcontract these specific areas of work, the proposed subcontractor(s) must demonstrate compliance with the special experience requirements. Once approved, no substitution will be permitted, unless the qualifications of the proposed replacement have been approved in writing in advance by the City.
 - (a) **Special Experience Requirement #1:** The contractor or subcontractor performing the work of this section must, within the last five (5) consecutive years prior to the bid opening, have successfully completed in a timely fashion at least three (3) projects similar in scope and type to the required work. In addition, the contractor or subcontractor must be certified, licensed or approved by the manufacturer. This Special Experience Requirement applies to the contractor or subcontractor that will perform specific areas of work specified in the section set forth below.

Electrical Work

- Section 28 31 11: Fire Alarm System
-

VIII. REVISIONS: SPECIFICATIONS AND CONTRACT DRAWINGS

The Specifications and the Contract Drawings for the Project are revised in accordance with the provisions set forth below.

- (1) Owner: Wherever the term "Owner" is used in the Specifications and/or the Contract Drawings, such term shall mean the City of New York.
- (2) Other Entities: In the event any entity other than the City of New York is referred to or named as the "Owner" in the Specifications and/or the Contract Drawings, the name of such other entity is deemed deleted and replaced with the "City of New York".
- (3) Architect / Engineer: Wherever the words "Architect", "Engineer", "Architect / Engineer" or "Architect and/or Engineer" are used in the Specifications and/or the Contract Drawings, such words are deemed deleted and replaced with the word "Commissioner".
- (4) Products / Manufacturers: Wherever the Specifications and/or the Contract Drawings require the contractor to provide a particular product (i.e., material and/or equipment) from a designated manufacturer and/or vendor, the term "or approved equal" is deemed inserted, even if only one product and/or manufacturer is specified, except as otherwise provided below.
 - (a) Proprietary Items: If the Bid Booklet contains a Notice which identifies a particular product from a designated manufacturer as a "Proprietary Item", the Contractor shall be required to provide such specified product. In such case, no substitution or "approved equal" will be permitted.
- (5) Special Experience Requirements: Special Experience Requirements for the Project, if any, are set forth in the Bid Booklet. Special Experience Requirements may apply to contractors, subcontractors, installers, manufacturers and/or suppliers. If the Specifications and/or the Contract Drawings contain any Special Experience Requirement that is not set forth in the Bid Booklet, such Special Experience Requirement is deemed deleted, except as otherwise provided below.
 - (a) Any Special Experience Requirement that provides that the entity performing the work or supplying the material must have more than three (3) years of experience, is revised to provide that the entity performing the work or supplying the material must have three (3) years of experience, except as described in paragraph (b) below.
 - (b) Any Special Experience Requirement that pertains to the abatement of hazardous materials shall not be subject to the deletion and/or revision set forth above. Such Special Experience Requirement shall remain in full force and effect.
 - (c) Any Special Experience Requirement that provides that the entity performing the work must be licensed, authorized, certified, approved by or acceptable to the manufacturer, is deemed deleted and replaced with the requirement that such entity must be properly trained for the specified work.
 - (d) Any Special Experience Requirement that provides that the individual workers performing the work must be licensed, authorized, certified, approved by or acceptable to the manufacturer, is deemed deleted and replaced with the requirement that such individual workers must be properly trained for the specified work.
- (6) Alternate Bids: If the agency is requesting the submission of Alternate Bids, a Notice regarding such Alternate Bids is set forth in the Bid Booklet. In the event of any conflict or inconsistency between (1) the Notice regarding Alternate Bids set forth in the Bid Booklet and (2) a provision in the Specifications and/or the Contract Drawings regarding Alternate Bids, the Notice set forth in the Bid Booklet shall prevail. If the agency is not requesting the submission of Alternate Bids, as indicated by the absence of a Notice in the Bid Booklet, and the Specifications and/or the Contract Drawings contain any provision regarding Alternate Bids, such provision is deemed deleted.
- (7) Contractor Retained Engineer: If the Specifications and/or the Contract Drawings require the Contractor to retain an Engineer to provide engineering services for the Project, the following sentence is deemed inserted: "Such Engineer must be a Professional Engineer, licensed in the State of New York."

- (8) LEED Related Provisions: If the Specifications and/or the Contract Drawings require the Contractor to purchase FSC certified wood, rapidly renewable materials, or materials within 500 miles, such provisions are deemed deleted and replaced with the requirement that if the contractor has purchased FSC certified wood, rapidly renewable materials, or materials within 500 miles, the contractor shall submit such forms or documentation as may be required by the City in order for the USGBC to certify that the Project qualifies for the related LEED credit(s).
- (9) Guarantees: Requirements for Guarantees and Maintenance are set forth in Schedule B, which is included in the Addendum to the General Conditions. In the event of any conflict or inconsistency between (1) a guarantee and/or maintenance requirement set forth in the Specifications and/or the Contract Drawings and (2) a guarantee and/or maintenance requirement set forth in Schedule B, the guarantee and/or maintenance requirement set forth in Schedule B shall prevail.
- (10) Warranties: Requirements for Warranties are set forth in Schedule B, which is included in the Addendum to the General Conditions.
- (a) In the event of any conflict or inconsistency between (1) a warranty requirement set forth in the Specifications and/or the Contract Drawings and (2) a warranty requirement set forth in Schedule B, the warranty requirement set forth in Schedule B shall prevail.
- (b) In the event a warranty requirement set forth in the Specifications and/or the Contract Drawings is omitted from Schedule B, such omission from Schedule B shall have no effect and the Contractor's obligation to provide the manufacturer's warranty, as set forth in the Specifications and/or the Contract Drawings, shall remain in full force and effect.
- (c) In the event a warranty requirement for a particular item of material or equipment is omitted from Schedule B, as well as from the Specifications or the Contract Drawings, and the manufacturer of such item actually provides a warranty, the Contractor shall be obligated to obtain and deliver to the Commissioner the highest level of warranty actually provided by that manufacturer.
- (11) Exculpatory Provisions: In the event the Specifications and/or the Contract Drawings contain any provision whereby the consultant and/or any of its officers, employees or agents, including subconsultants, is absolved of responsibility for any act or omission, such provision is deemed deleted.
- (12) Insurance: Provisions regarding insurance coverage the Contractor is required to provide are set forth in Article 22 of the City of New York Standard Construction Contract and Schedule A, which is included in the Addendum to the General Conditions. In the event the Specifications and/or the Contract Drawings contain any provision regarding insurance requirements, such provision is deemed deleted.
- (13) Indemnification: Provisions regarding indemnification are set forth in Articles 7, 12, 22 and 57 of the City of New York Standard Construction Contract. In the event the Specifications and/or the Contract Drawings contain any provision regarding indemnification, such provision is deemed deleted.
- (14) Dispute Resolution: Provisions regarding dispute resolution are set forth in Article 27 of the City of New York Standard Construction Contract. In the event the Specifications and/or the Contract Drawings contain any provision regarding dispute resolution, such provision is deemed deleted.
- (15) Payment to Other Entities: In the event the Specifications and/or the Contract Drawings contain any provision which requires the Contractor to make payments to an entity other than a subcontractor and/or supplier providing services and/or material for the project, such provision is deemed deleted.
- (16) General Conditions: In the event of any conflict or inconsistency between (1) the Specifications and/or the Contract Drawings and (2) the General Conditions, the General Conditions shall prevail.
- (17) Standard Construction Contract: In the event of any conflict or inconsistency between (1) the Specifications and/or the Contract Drawings and (2) the City of New York Standard Construction Contract, the City of New York Standard Construction Contract shall prevail.

SCHEDULE A (FOR PUBLICLY BID PROJECTS)
Contract Requirements

Various Articles of the Contract refer to requirements which are set forth in Schedule A of the General Conditions. The Schedule set forth below specifies the following: (1) the referenced Articles of the Contract, and (2) the specific requirements applicable to each separate contract.

REFERENCE	ITEM	REQUIREMENTS	CONTRACT #1	CONTRACT #2	CONTRACT #3	CONTRACT #4
Article 14 Contract	Time of Completion	Consecutive Calendar Days	550 ccds	550 ccds	550 ccds	550 ccds
Article 15 Contract	Liquidated Damages	For each consecutive calendar day over completion time	\$900	\$180	\$600	\$900
Article 17 Contract	Sub-contracts	Not to exceed percent of Contract Price	60%	25%	60%	25%
Article 21 Contract	Retainage	Percent of Voucher	If 100% bonds are required			5%
			If 100% bonds are not required, and Contract Price is less than \$1,000,000			10%
			If 100% bonds are not required, and Contract Price is more than \$1,000,000			10%
Article 24 Contract	Maintenance & Guaranty	Percent of Contract Price	1%	1%	1%	1%
Article 76 Contract	MWBE Program	See Subcontract Utilization Plan in the Bid Booklet				

SCHEDULE A (FOR PUBLICLY BID PROJECTS)

Relating to Article 22 - Insurance

PART I. Minimum Limits and Special Conditions

Insurance indicated by a blackened box (■) or by (X) in the to left will be required under this contract.

Types of Insurance (per Article 22 in its entirety, including listed paragraph)	Minimum Limits and Special Conditions
<p>■ Commercial General Liability Art. 22.1.1</p>	<p>\$ 1,000,000 per occurrence \$ 2,000,000 aggregate (applicable separately to this Project)</p> <p>Additional Insureds: 1. City of New York, including its officials and employees, and 2. The Alliance of Resident Theatres/New York A.R.T./New York 3. Department of Cultural Affairs</p>
<p>■ Workers' Compensation Art. 22.1.2</p> <p>■ Disability Benefits Insurance Art. 22.1.2</p> <p>■ Employers' Liability Art. 22.1.3</p> <p><input type="checkbox"/> Jones Act Art. 22.1.4</p> <p><input type="checkbox"/> U.S. Longshoremen's and Harbor Workers Compensation Act Art. 22.1.4</p>	<p>Workers' Compensation: Statutory per New York State law without regard to jurisdiction</p> <p>Disability Benefits Insurance: Statutory per New York State law without regard to jurisdiction</p> <p>Employers' Liability: \$1,000,000 each accident</p>
<p><input type="checkbox"/> Builders' Risk Art. 22.1.5</p> <p>■ Installation Floater</p>	<p>Applicable to Builders' Risk or Installation Floater:</p> <p>_____ 100 _____ % of total value of Work</p> <p>City of New York and the Contractor named as Loss Payee for the Work in order of precedence, as their interests may appear.</p> <p><u>Note:</u> Article 22.1.5 is revised by deleting the following sentence: "Such policy shall name as insureds the City, the Contractor, and its Subcontractors". This deletion applies to Builders' Risk and Installation Floater.</p>

SCHEDULE A (FOR PUBLICLY BID PROJECTS)

Relating to Article 22 - Insurance

PART I. Minimum Limits and Special Conditions (Continued)

Insurance indicated by a blackened box (■) or by (X) in the to left will be required under this contract.

Types of Insurance (per Article 22 in its entirety, including listed paragraph)	Minimum Limits and Special Conditions
<input checked="" type="checkbox"/> Comprehensive Business Auto Coverage Art. 22.1.6	\$ <u>1,000,000</u> per accident If vehicles are used for transporting hazardous materials, the Contractor shall provide pollution liability broadened coverage for covered autos (endorsement CA 99 48) as well as proof of MCS 90 Additional Insured: 1. City of New York, including its officials and employees
<input type="checkbox"/> Pollution/Environmental Liability Art. 22.1.7	\$ _____ per occurrence \$ _____ aggregate Additional Insureds: 1. City of New York, including its officials and employees, and 2. _____ 3. _____
<input type="checkbox"/> Marine Protection and Indemnity Art. 22.1.8(a)	\$ _____ per occurrence \$ _____ aggregate Additional Insureds: 1. City of New York, including its officials and employees, and 2. _____ 3. _____

SCHEDULE A (FOR PUBLICLY BID PROJECTS)

Relating to Article 22 - Insurance

PART I. Minimum Limits and Special Conditions (Continued)

Insurance indicated by a blackened box (■) or by (X) in the to left will be required under this contract.

<input type="checkbox"/> Ship Repairers Legal Liability Art. 22.1.8(b)	\$ _____ each occurrence [Contracting agency to fill in total value of City vessels involved]
<input type="checkbox"/> Collision Liability/Towers Liability Art. 22.1.8(c)	\$ _____ per occurrence \$ _____ aggregate Additional Insureds: 1. City of New York, including its officials and employees, and 2. _____ 3. _____
<input type="checkbox"/> Marine Pollution Liability Art. 22.1.8(d)	\$ _____ each occurrence Additional Insureds: 1. City of New York, including its officials and employees, and 2. _____ 3. _____
[OTHER] Art. 22.1.9 <input type="checkbox"/> Railroad Protective Liability _____	\$ _____ per occurrence \$ _____ aggregate Additional Insureds: 1. City of New York, including its officials and employees, and 2. _____ 3. _____

SCHEDULE A (FOR PUBLICLY BID PROJECTS)

Relating to Article 22 - Insurance

PART I. Minimum Limits and Special Conditions (Continued)

Insurance indicated by a blackened box (■) or by (X) in the to left will be required under this contract.

<p>[OTHER]</p> <p align="right">Art. 22.1.9</p> <p><input type="checkbox"/> Asbestos Liability</p>	<p>Only required of the Contractor or Subcontractor performing any required asbestos removal.</p> <p>\$1,000,000 each occurrence, \$2,000,000 aggregate (Combined Single Limit);</p> <p>Additional Insureds: 1. City of New York, including its officials and employees, and 2. _____ 3. _____</p>
<p>[OTHER]</p> <p align="right">Art. 22.1.9</p> <p><input type="checkbox"/> Boiler Insurance</p>	<p>\$200,000</p>
<p>[OTHER]</p> <p align="right">Art. 22.1.9</p> <p>■ Professional Liability</p> <p>In the event any section of the Specifications requires the Contractor to engage a Professional Engineer to provide design and/or engineering services, the Engineer engaged by the Contractor, as well as any sub consultant(s) performing professional services, shall provide Professional Liability Insurance.</p>	<p>\$1,000,000 per occurrence</p> <p>The Contractor's Professional Engineer shall maintain and submit evidence of Professional Liability Insurance in the minimum amount of \$1,000,000 per claim. The policy or policies shall include an endorsement to cover the liability assumed by the Contractor under this Agreement arising out of the negligent performance of professional services or caused by an error, omission or negligent act of the Contractor's Professional Engineer or anyone employed by the Contractor's Professional Engineer.</p> <p>Claims-made policies will be accepted for Professional Liability Insurance. All such policies shall have an extended reporting period option or automatic coverage of not less than two (2) years. If available as an option, the Contractor's Professional Engineer shall purchase extended reporting period coverage effective on cancellation or termination of such insurance unless a new policy is secured with a retroactive date, including at least the last policy year.</p>

SCHEDULE A (FOR PUBLICLY BID PROJECTS)

Relating to Article 22 - Insurance

PART II. Broker's Certification

[Pursuant to Article 22.3.1(a) of the **Contract**, every Certificate of Insurance must be accompanied by either the following certification by the broker setting forth the following text and required information and signatures or complete copies of all policies referenced in the Certificate of Insurance. In the absence of completed policies, binders are acceptable.]

CERTIFICATION BY BROKER

The undersigned insurance broker represents to the City of New York that the attached Certificate of Insurance is accurate in all material respects, and that the described insurance is effective as of the date of this Certification.

[Name of broker (typewritten)]

[Address of broker (typewritten)]

[Signature of authorized official or broker]

[Name and title of authorized official (typewritten)]

Sworn to before me this
____ day of _____, 201_

NOTARY PUBLIC

SCHEDULE A (FOR PUBLICLY BID PROJECTS)

Relating to Article 22 - Insurance

PART III. Address of Commissioner

Wherever reference is made in Article 7 or Article 22 to documents to be sent to the **Commissioner** (e.g., notices, filings, or submissions), such documents shall be sent to the address set forth below or, in the absence of such address, to the **Commissioner's** address as provided elsewhere in this **Contract**.

ACCO's Office, Insurance Unit

30-30 Thomson Avenue, 4th Floor

Long Island City, New York 11101

SCHEDULE B

Guarantees and Warranties

(Reference: Article 1.22 of the General Conditions)

GUARANTY FROM CONTRACTOR

(1) **Contractor's Guaranty Obligation:** The Contractor shall promptly repair, replace, restore or rebuild, as the Commissioner may determine, any finished Work in which defects of materials or workmanship may appear or to which damage may occur because of such defects, during the one (1) year period subsequent to the date of Substantial Completion (or use and occupancy in accordance with the Contract), except for the areas of Work set forth below:

- Roofing, Waterproofing, and Joint Sealant Work. For these types of work, the guarantee period shall be (2) two years.
- Trees and/or Plant Material. For trees and/or plant material furnished and installed, the guarantee period shall be (2) two years. During the guarantee period, the Contractor shall provide all maintenance services set forth in the Specifications.

(2) **Guaranty Period:** The obligation of the Contractor, and its Surety under the Performance Bond, is limited to the period(s) of time specified above.

(3) **Other Provisions Deemed Deleted:** In the event the Specifications and/or the Contract Drawings contain any provisions regarding guaranty requirements, such provisions are deemed deleted and replaced with the guaranty requirements set forth in this Schedule B.

WARRANTY FROM MANUFACTURER

(1) **Contractor's Obligation to Provide Warranties:** The items of material and/or equipment for which manufacturer warranties are required are listed below. For each item of material and/or equipment listed below, the Contractor shall obtain a written warranty from the manufacturer. Such warranty shall provide that the material or equipment is free from defects for the period set forth below and will be replaced or repaired within such specified period. The Contractor shall deliver all required warranties to the Commissioner.

(2) **Required Warranties:**

Specification Number	Material or Equipment	Warranty Period
078123	Fireproofing	2 years
079200	Sealants	5 years
081416	Wood Doors	Life of Installation
083473	Sound Control Doors	5 years
083513	Aluminum Sliding Glass Wall	10 years (rollers and seal)
		2 years (all other components)
		20 years (special finish)
084113	Interior Aluminum Storefront	10 years (material)
		20 years (finish)

Specification Number	Material or Equipment	Warranty Period
085113	Interior Aluminum Window	3 years (material)
		10 years (glass)
		20 years (finish)
087100	Door Hardware	1 year
		10 years (mortise locks, latches, and door closers)
		2 years (electromechanical hardware)
088000	Glass	5 years (general)
		10 years (insulated)
		5 years (laminated)
096813	Tile Carpeting	10 years
097723	Fabric Panels	2 years
101400	Signage	5 years
113100	Appliances	2 years (general)
		2 years (Refrigerator)
		5 years (Dishwasher Tub and Metal Door Liner)
		3 years (clothes washer)
116123	Performance Platforms	2 years (Paint and exterior finishes are excluded)
116143	Performance Draperies and Rigging Accessories	2 years
116151	Performance Pipe Grid	1 year
116191	Performance Lighting Instruments and Accessories	1 year
142400	Hydraulic Elevators	1 year
144200	Wheelchair Lifts	5 years
223300	Electric Domestic Water Heaters	5 years (Instantaneous Electric Water Heaters)
		3 years (Commercial Electric Water Heaters Storage Tank)
		1 year (Commercial Electric Water Heaters Storage Tank Controls and Other Components)
233600	Air Terminal Units	5 years
238219	Fan Coil Units	1 year
		42 months from shipment, 36 months from start-up (VFD)
238239	Unit Heaters	1 year
260943	Network Lighting Controls	2 years (general)
		8 years (transient voltage)
		10 years (electrically held relays)
262200	Low-Voltage Distribution Transformers	1 year
263353	Static Uninterruptible Power Supply	2 years

Specification Number	Material or Equipment	Warranty Period
264313	Transient-Voltage Suppression for Low-Voltage Electrical Power Circuits	5 years
265100	Interior Lighting	10 years (Emergency Lighting Unit Batteries)
		7 years (Exit Sign Batteries)
		5 years (Ballasts)
		1 year (T5 and T8 Lamps)
266111	Performance Dimming and Control	2 years
270500	Common Work Results for Communications	25 years
274116	Audio and Audiovisual Systems	1 year

(3) **Application:** The obligations under the warranty for the periods specified above shall apply only to the manufacturer of the material or equipment, and not to the Contractor or its Surety; provided, however, the Contractor retains responsibility for obtaining all required warranties from the manufacturers and delivering the same to the Commissioner.

(4) **Other Provisions:** The warranty requirements set forth in this Schedule B are also included in the Specifications.

- (a) In the event of any conflict between a warranty requirement set forth in the Specifications and a warranty requirement set forth in Schedule B, the warranty requirement set forth in Schedule B shall take precedence.
- (b) In the event a warranty requirement set forth in the Specifications is omitted from Schedule B, such omission from Schedule B shall have no effect and the Contractor's obligation to provide the manufacturer's warranty, as set forth in the Specifications, shall remain in full force and effect.
- (c) In the event a warranty requirement for a particular item of material or equipment is omitted from both Schedule B and the Specifications, and the manufacturer of such item actually provides a warranty, the Contractor shall be obligated to obtain and deliver to the Commissioner the highest level of warranty actually provided by that manufacturer.
- (d) In the event a warranty requirement is provided for a particular item of material or equipment, and such requirement specifies a warranty period that is longer than that which is actually provided by any of the specified manufacturers, the Contractor shall be obligated to obtain and deliver to the Commissioner the highest level of warranty actually provided by any of the specified manufacturers, unless otherwise directed in writing by the Commissioner.

SCHEDULE C

Contract Drawings

(Reference: Article 1.04(A) of the General Conditions)

The Schedule set forth below lists all Contract Drawings for the Project.

CONTRACT NO.1: GENERAL CONSTRUCTION

GENERAL

T-000.00	TITLE SHEET
G-001.00	SYMBOLS AND ABBREVIATIONS, GENERAL NOTES
G-002.00	BUILDING INFORMATION
G-003.00	GENERAL NOTES
G-004.00	PREDETERMINATION
G-005.00	PREDETERMINATION
G-006.00	PREDETERMINATION

ARCHITECTURAL

A-001.00	SITE PLAN
DM-001.00	GROUND FLOOR - DEMOLITION PLAN
DM-002.00	MEZZANINE FLOOR - DEMOLITION PLAN
DM-003.00	SECOND FLOOR - DEMOLITION PLAN
A-014.00	PARTITION TYPES
A-015.00	FINISH ASSEMBLY DETAILS AND TRANSITION DETAILS
A-016.00	BASE DETAILS
A-100.00	GROUND FLOOR - PLAN
A-101.00	MEZZANINE FLOOR LOWER - PLAN
A-102.00	MEZZANINE FLOOR UPPER - PLAN
A-103.00	SECOND FLOOR LOWER - PLAN
A-104.00	SECOND FLOOR UPPER - PLAN
A-105.00	GROUND FLOOR AND MEZZANINE FLOOR LOWER - FINISH, FURNITURE & EQUIPMENT AND MOVABLE MILLWORK PLAN
A-106.00	MEZZANINE FLOOR UPPER - FINISH, FURNITURE & EQUIPMENT AND MOVABLE MILLWORK PLAN
A-107.00	SECOND FLOOR LOWER AND UPPER - FINISH, FURNITURE & EQUIPMENT AND MOVABLE MILLWORK PLAN
A-120.00	GROUND FLOOR - REFLECTED CEILING PLAN
A-121.00	MEZZANINE FLOOR LOWER - REFLECTED CEILING PLAN
A-122.00	MEZZANINE FLOOR UPPER - REFLECTED CEILING PLAN
A-123.00	SECOND FLOOR LOWER - REFLECTED CEILING PLAN
A-124.00	SECOND FLOOR UPPER - REFLECTED CEILING PLAN
A-125.00	GROUND FLOOR - ENLARGED REFLECTED CEILING PLAN
A-126.00	MEZZANINE FLOOR LOWER - ENLARGED REFLECTED CEILING PLAN
A-127.00	MEZZANINE FLOOR UPPER - ENLARGED REFLECTED CEILING PLAN
A-128.00	MEZZANINE FLOOR THEATRE ONE - ENLARGED REFLECTED CEILING PLAN
A-129.00	SECOND FLOOR LOWER, UPPER, AND THEATRE TWO - ENLARGED REFLECTED CEILING PLAN

A-200.00	EXTERIOR NORTH BUILDING ELEVATION
A-201.00	EXTERIOR EAST BUILDING ELEVATION
A-300.00	BUILDING SECTION
A-301.00	BUILDING SECTION
A-302.00	BUILDING SECTION
A-303.00	BUILDING SECTION
A-304.00	BUILDING SECTION
A-310.00	WALL SECTIONS
A-311.00	WALL SECTIONS
A-312.00	WALL SECTIONS
A-400.00	STAIR ENLARGED PLAN AND SECTIONS
A-401.00	STAIR ENLARGED PLAN AND SECTIONS
A-402.00	STAIR, SLOPED SURFACES, AND PLATFORM LIFT ENLARGED PLANS AND SECTION
A-403.00	ELEVATOR ENLARGED PLAN, ELEVATIONS, AND SECTION
A-410.00	STAIR DETAILS
A-411.00	STAIR AND SLOPED SURFACE DETAILS
A-500.00	GROUND FLOOR –INTERIOR ELEVATIONS
A-501.00	GROUND FLOOR –INTERIOR ELEVATIONS
A-510.00	MEZZANINE FLOOR LOWER – WC ENLARGED PLAN & INTERIOR ELEVATIONS
A-511.00	MEZZANINE FLOOR LOWER – LOBBY INTERIOR ELEVATIONS
A-512.00	MEZZANINE FLOOR LOWER – LOBBY INTERIOR ELEVATIONS
A-513.00	MEZZANINE FLOOR LOWER – LOBBY INTERIOR ELEVATIONS
A-514.00	MEZZANINE FLOOR LOWER – DRESSING ROOMS ENLARGED PLAN & INTERIOR ELEVATIONS
A-515.00	MEZZANINE FLOOR LOWER – JANITOR CL/ OFFICE ENLARGED PLAN & INTERIOR ELEVATIONS
A-516.00	MEZZANINE FLOOR LOWER – THEATER INTERIOR ELEVATIONS
A-517.00	MEZZANINE FLOOR LOWER – THEATER INTERIOR ELEVATIONS
A-518.00	MEZZANINE FLOOR LOWER – THEATER INTERIOR ELEVATIONS
A-519.00	MEZZANINE FLOOR LOWER AND UPPER – PROP ROOM/ CONTROL BOOTH INTERIOR ELEVATIONS
A-520.00	SECOND FLOOR LOWER – LOBBY INTERIOR ELEVATIONS
A-521.00	SECOND FLOOR LOWER – LOBBY INTERIOR ELEVATIONS
A-522.00	SECOND FLOOR LOWER – WC/ THEATER ENLARGED PLAN & INTERIOR ELEVATIONS
A-523.00	SECOND FLOOR LOWER – DRESSING ROOM/ THEATER ENLARGED PLAN & INTERIOR ELEVATIONS
A-524.00	SECOND FLOOR – CORRIDOR AND CONTROL BOOTH INTERIOR ELEVATIONS
A-600.00	MATERIAL & FINISH SCHEDULES
A-601.00	PLUMBING FIXTURE/ BATHROOM ACCESSORY/ EQUIPMENT SCHEDULES
A-603.00	DOOR HARDWARE SCHEDULE
A-604.00	DOOR SCHEDULE
A-605.00	DOOR DETAILS
A-606.00	DOOR DETAILS
A-607.00	DOOR DETAILS
A-610.00	WINDOW SCHEDULE
A-611.00	WINDOW DETAILS
A-612.00	SIGN SCHEDULE
A-613.00	MILLWORK SCHEDULE
A-800.00	INTERIOR DETAILS
A-801.00	INTERIOR DETAILS
A-802.00	INTERIOR DETAILS
A-810.00	EXTERIOR DETAILS

A-900.00 MILLWORK DETAILS
A-901.00 MILLWORK DETAILS
A-902.00 MILLWORK DETAILS
A-903.00 MILLWORK DETAILS
A-904.00 MILLWORK DETAILS
A-905.00 MILLWORK DETAILS
A-906.00 MILLWORK DETAILS
A-907.00 MILLWORK DETAILS
A-908.00 MILLWORK DETAILS

STRUCTURAL

S-001.00 STRUCTURAL SYMBOLS, ABBREVIATIONS, AND DRAWING LIST
S-002.00 STRUCTURAL GENERAL NOTES
S-010.00 STRUCTURAL LOADING DIAGRAMS
S-401.00 STRUCTURAL GROUND FLOOR PLAN
S-402.00 STRUCTURAL MEZZANINE FLOOR LOWER PLAN
S-403.00 STRUCTURAL MEZZANINE FLOOR UPPER PLAN
S-404.00 STRUCTURAL SECOND FLOOR LOWER PLAN
S-405.00 STRUCTURAL SECOND FLOOR UPPER PLAN
S-601.00 STRUCTURAL FACE PLATE DETAILS
S-602.00 STRUCTURAL FACE PLATE DETAILS
S-603.00 STRUCTURAL STAIR DETAILS
S-604.00 STRUCTURAL STEEL CONNECTION DETAILS
S-605.00 STRUCTURAL SLAB DEMOLITION DETAILS
S-701.00 STRUCTURAL TYPICAL DETAILS CONCRETE
S-702.00 STRUCTURAL TYPICAL DETAILS CONCRETE
S-710.00 STRUCTURAL TYPICAL DETAILS STEEL CONNECTIONS
S-711.00 STRUCTURAL TYPICAL DETAILS STEEL CONNECTIONS
S-712.00 STRUCTURAL TYPICAL DETAILS STEEL CONNECTIONS
S-720.00 STRUCTURAL TYPICAL DETAILS SLAB ON METAL DECK
S-721.00 STRUCTURAL TYPICAL DETAILS SLAB ON METAL DECK
S-731.00 STRUCTURAL TYPICAL DETAILS SLAB ON METAL DECK

VERTICAL TRANSPORTATION

VT-001.00 VERTICAL TRANSPORTATION GROUND FLOOR PLAN

COMMUNICATIONS

T-001.00 COMMUNICATIONS NOTES, SYMBOLS, ABBREVIATIONS, AND DRAWING LIST
T-301.00 COMMUNICATIONS RISER DIAGRAMS
T-401.00 COMMUNICATIONS GROUND FLOOR PLAN
T-402.00 COMMUNICATIONS MEZZANINE FLOOR LOWER PLAN
T-403.00 COMMUNICATIONS MEZZANINE FLOOR UPPER PLAN
T-404.00 COMMUNICATIONS SECOND FLOOR LOWER PLAN
T-405.00 COMMUNICATIONS SECOND FLOOR UPPER PLAN
T-701.00 COMMUNICATIONS ENCLOSURE DETAIL
T-801.00 COMMUNICATIONS DETAILS

SECURITY

X-001.00 SECURITY NOTES, SYMBOLS, ABBREVIATIONS, AND DRAWING LIST
X-401.00 SECURITY GROUND FLOOR PLAN
X-402.00 SECURITY MEZZANINE FLOOR LOWER PLAN
X-403.00 SECURITY MEZZANINE FLOOR UPPER PLAN

X-404.00 SECURITY SECOND FLOOR LOWER PLAN
X-405.00 SECURITY SECOND FLOOR UPPER PLAN

THEATRE

AV-001.00 AV SYSTEMS, KEY
AV-002.00 GENERAL ARRANGEMENTS, POWER AND GROUNDING DETAILS
AV-111.00 AV SYSTEMS GROUND LEVEL/ THEATRE 1 PLAN
AV-112.00 AV SYSTEMS THEATRE 1 UPPER LEVEL PLAN
AV-113.00 AV SYSTEMS THEATRE 2 LOWER LEVEL PLAN
AV-114.00 AV SYSTEMS THEATRE 2 UPPER LEVEL PLAN
AV-115.00 AV SYSTEMS LOBBY PLAN
AV-211.00 AV SYSTEMS CONDUIT RISER
AV-212.00 AV SYSTEMS INTERCOM ONE-LINES
AV-213.00 AV SYSTEMS AUDIO ONE-LINES THEATRE 1
AV-214.00 AV SYSTEMS AUDIO ONE-LINES THEATRE 2
AV-215.00 AV SYSTEMS VIDEO ONE-LINES THEATRE 1
AV-216.00 AV SYSTEMS VIDEO ONE-LINES THEATRE 2
AV-217.00 AV SYSTEMS PAGING ONE-LINES BUILDING WIDE
AV-218.00 AV SYSTEMS DATA ONE-LINES
AV-219.00 AV SYSTEMS AV NETWORK ONE-LINES
AV-311.00 AV SYSTEMS FACE PLATE DETAILS AND AV BOX SCHEDULE
AV-312.00 AV SYSTEMS RACK ELEVATIONS
AV-313.00 AV SYSTEMS DETAILS

TE-000.00 THEATRE EQUIPMENT NOTES
TE-111.00 THEATRE EQUIPMENT THEATRE 1 LOWER LEVEL PLAN
TE-112.00 THEATRE EQUIPMENT THEATRE 1 UPPER LEVEL PLAN
TE-113.00 THEATRE EQUIP. THEATRE 2 LOWER LEVEL PLAN
TE-114.00 THEATRE EQUIP. THEATRE 2 UPPER LEVEL PLAN
TE-121.00 THEATRE EQUIP. THEATRE 1 SECTIONS
TE-122.00 THEATRE EQUIP. THEATRE 2 SECTIONS
TE-131.00 THEATRE EQUIPMENT THEATRE 1 PLATFORM LAYOUTS
TE-132.00 THEATRE EQUIPMENT THEATRE 2 PLATFORM LAYOUTS
TE-133.00 THEATRE EQUIPMENT DETAILS
TE-134.00 THEATRE EQUIPMENT PIPE GRID AND STRONG POINT DETAILS
TE-136.00 THEATRE EQUIPMENT THEATRE 1 BLACKOUT CURTAIN DETAILS
TE-141.00 THEATRE EQUIPMENT SCHEDULES

TL-101.00 THEATRE LIGHTING THEATRE 1 LOW VOLTAGE LAYOUT
TL-102.00 THEATRE LIGHTING THEATRE 2 LOW VOLTAGE LAYOUT
TL-103.00 THEATRE LIGHTING LOBBY/GROUND LEVEL LOW VOLTAGE LAYOUT
TL-211.00 THEATRE LIGHTING RISER DIAGRAM AND BOX SCHEDULE
TL-212.00 THEATRE LIGHTING ONE LINES
TL-213.00 THEATRE LIGHTING FACEPLATE DETAILS

TS-111.00 THEATRE SEATING THEATRE 1 END STAGE
TS-112.00 THEATRE SEATING THEATRE 1 THRUST STAGE
TS-113.00 THEATRE SEATING THEATRE 1 FLAT FLOOR STAGE
TS-114.00 THEATRE SEATING THEATRE 1 ARENA 150 STAGE
TS-211.00 THEATRE SEATING THEATRE 2 END STAGE

CONTRACT NO.2: PLUMBING

PLUMBING

P-001.00	PLUMBING NOTES, SYMBOLS, ABBREVIATIONS, AND DRAWING LIST
P-301.00	PLUMBING SANITARY RISER DIAGRAM
P-302.00	PLUMBING DOMESTIC WATER RISER DIAGRAM
P-401.00	PLUMBING GROUND FLOOR PLAN
P-402.00	PLUMBING MEZZANINE FLOOR LOWER PLAN
P-403.00	PLUMBING MEZZANINE FLOOR UPPER PLAN
P-404.00	PLUMBING SECOND FLOOR LOWER PLAN
P-405.00	PLUMBING SECOND FLOOR UPPER PLAN
P-701.00	PLUMBING ENLARGED PART PLANS
P-801.00	PLUMBING DETAILS
P-802.00	PLUMBING DETAILS

CONTRACT NO.3: HVAC/FIRE PROTECTION

MECHANICAL

M-001.00	MECHANICAL GENERAL NOTES AND DRAWING LIST
M-002.00	MECHANICAL SYMBOLS AND ABBREVIATIONS
M-003.00	MECHANICAL EQUIPMENT SCHEDULES
M-301.00	MECHANICAL AIRSIDE VENTILATION SINGLE LINE DIAGRAM
M-302.00	MECHANICAL AIRSIDE EXHAUST SINGLE LINE DIAGRAM
M-303.00	MECHANICAL CHILLED WATER SINGLE LINE DIAGRAM
M-304.00	MECHANICAL HEATING HOT WATER SINGLE LINE DIAGRAM
M-401.00	MECHANICAL DUCTWORK GROUND FLOOR PLAN
M-402.00	MECHANICAL DUCTWORK MEZZANINE FLOOR LOWER PLAN
M-403.00	MECHANICAL DUCTWORK MEZZANINE FLOOR UPPER PLAN
M-404.00	MECHANICAL DUCTWORK SECOND FLOOR LOWER PLAN
M-405.00	MECHANICAL DUCTWORK SECOND FLOOR UPPER PLAN
M-501.00	MECHANICAL PIPING GROUND FLOOR PLAN
M-502.00	MECH PIPING MEZZANINE FLOOR LOWER PLAN
M-503.00	MECH PIPING MEZZANINE FLOOR UPPER PLAN
M-504.00	MECH PIPING SECOND FLOOR LOWER PLAN
M-505.00	MECH PIPING SECOND FLOOR UPPER PLAN
M-701.00	MECHANICAL PART PLAN MEZZ FLOOR UPPER
M-702.00	MECHANICAL PART PLAN SECOND FLOOR UPPER
M-703.00	MECHANICAL PART PLANS MEZZ FLOOR UPPER
M-801.00	MECHANICAL DETAILS SHEET 1
M-802.00	MECHANICAL DETAIL SHEET 2
M-803.00	MECHANICAL DETAIL SHEET 3
M-804.00	MECHANICAL DETAIL SHEET 4
M-805.00	MECHANICAL DETAIL SHEET 5
M-901.00	MECH CONTROLS NOTES, SYMBOLS, ABBREV.
M-902.00	MECH CONTROLS FAN COIL UNIT SCHEMATICS
M-903.00	MECH CONTROLS DETAILS

FIRE PROTECTION

FP-001.00	FIRE PROTECTION NOTES, SYMBOLS, ABBREVIATIONS, RISER DIAGRAM, AND DWG LIST
FP-002.00	FIRE PROTECTION NOTES
FP-401.00	FIRE PROTECTION GROUND FLOOR PLAN
FP-402.00	FIRE PROTECTION MEZZANINE FLOOR PLAN LOWER
FP-403.00	FIRE PROTECTION MEZZANINE FLOOR PLAN UPPER
FP-404.00	FIRE PROTECTION SECOND FLOOR PLAN LOWER

FP-405.00 FIRE PROTECTION SECOND FLOOR PLAN UPPER
FP-801.00 FIRE PROTECTION DETAILS
FP-802.00 FIRE PROTECTION DETAILS

CONTRACT NO.4: ELECTRICAL

ELECTRICAL

E-001.00 ELECTRICAL NOTES, SYMBOLS, ABBREVIATIONS AND DRAWING LIST
E-003.00 ELECTRICAL GENERAL NOTES
E-004.00 ELECTRICAL PANEL SCHEDULES
E-005.00 ELECTRICAL PANEL SCHEDULES
E-006.00 ELECTRICAL FEEDER AND TRANSFORMER SCHEDULES
E-301.00 ELECTRICAL POWER RISER DIAGRAM
E-401.00 ELECTRICAL GROUND FLOOR LIGHTING PLAN
E-402.00 ELECTRICAL MEZZANINE FLOOR LOWER LIGHTING PLAN
E-403.00 ELECTRICAL MEZZANINE FLOOR UPPER LIGHTING PLAN
E-404.00 ELECTRICAL SECOND FLOOR LOWER LIGHTING PLAN
E-405.00 ELECTRICAL SECOND FLOOR UPPER LIGHTING PLAN
E-500.00 ELECTRICAL CELLAR POWER PLAN
E-501.00 ELECTRICAL GROUND FLOOR POWER PLAN
E-502.00 ELECTRICAL MEZZANINE FLOOR LOWER POWER PLAN
E-503.00 ELECTRICAL MEZZANINE FLOOR UPPER POWER PLAN
E-504.00 ELECTRICAL SECOND FLOOR LOWER POWER PLAN
E-505.00 ELECTRICAL SECOND FLOOR UPPER POWER PLAN
E-800.00 ELECTRICAL FEEDER AND TRANSFORMER SCHEDULES
E-801.00 ELECTRICAL DETAILS
E-802.00 ELECTRICAL DETAILS
E-803.00 ELECTRICAL DETAILS
ED-502.00 ELECTRICAL DEMOLITION MEZZANINE FLOOR LOWER POWER PLAN
ED-504.00 ELECTRICAL DEMOLITION MEZZANINE FLOOR UPPER POWER PLAN

FA-001.00 FIRE ALARM NOTES, SYMBOLS, ABBREVIATIONS
FA-301.00 FIRE ALARM RISER DIAGRAM
FA-601.00 ELECTRICAL GROUND FLOOR FIRE ALARM PLAN
FA-602.00 ELECTRICAL MEZZANINE FLOOR LOWER FIRE ALARM PLAN
FA-603.00 ELECTRICAL MEZZANINE FLOOR UPPER FIRE ALARM PLAN
FA-604.00 ELECTRICAL SECOND FLOOR LOWER FIRE ALARM PLAN
FA-605.00 ELECTRICAL SECOND FLOOR UPPER FIRE ALARM PLAN

SCHEDULE D

Electrical Motor Control Equipment

(Reference: Article 1.37, Part K of the General Conditions)

Requirements for electrical motor equipment may be included in one or more sections of the Specifications for the Contract for the Project. Schedule D set forth below delineates specific information for electrical motor control equipment. In the event of any conflict between the Specifications and this Schedule D, Schedule D shall take precedence; provided, however, in the event of an omission from Schedule D (i.e., Schedule D omits either a reference to or information concerning electrical motor equipment which is set forth in the Specifications), such omission from Schedule D shall have no effect and the Contractor's obligation with respect to the electrical motor control equipment, as set forth in the Specifications, shall remain in full force and effect.

Legend for Control Type

DB Disconnect Circuit Breaker (Switch)	P Pilot Light	BG Break Glass Station
TS Thermal Switch	F Firestat	HOA Hand-Off Auto.
MS Magnetic Starter	T Thermostat	PB Push Button Station
CMS Comb. Mag. Starter	AL Alternator	RO Remote "off"

Equip. Ident.	Location	# of Units	HP or KW	Volts and Phase	Control Type: See legend above	Remarks:
FCU-G-1	GROUND LOBBY	1	0.75	120 / 1	CMS	
FCU-M-1	MEZZ LOUNGE	1	3	208 / 3	VFD	
FCU-M-2	MEZZ PROP SHOP	1	0.75	120 / 1	CMS	
FCU-M-3	MEZZ OFFICE	1	0.75	120 / 1	CMS	
FCU-M-4	MEZZ THEATRE	1	7.5	208 / 3	VFD	
FCU-M-5	MEZZ CONTROL ROOM	1	0.75	120 / 1	CMS	
FCU-2-1	LEVEL 2 LOBBY	1	1.5	120 / 1	CMS	
FCU-2-2	LEVEL 2 CONTROL ROOM	1	0.75	120 / 1	CMS	
FCU-2-3	LEVEL 2 THEATRE	1	5	208 / 3	VFD	
FCU-2-4	LEVEL 2 DRESSING ROOM	1	0.75	120 / 1	CMS	

Equip. Ident.	Location	# of Units	HP or KW	Volts and Phase	Control Type: See legend above	Remarks:
EF-1	MECHANICAL ROOM	1	0.25	120 / 1	CMS	
HANDICAPPED LIFT		2	15A FEE D	208/3	24V DC	

SCHEDULE E

Separation of Trades

(Reference: Article 1.40 of the General Conditions)

Requirements for various items of work are included in the Specifications for the Contract for the Project and in the General Conditions. Schedule E set forth below delineates the responsibilities of each trade for various items of work, as well as the extent to which certain items involve coordination between trades. The delineation set forth in this Schedule E shall be taken as specific instruction to the Contractor that it is responsible for the listed items of work. Schedule E is not intended to limit the Contractor's responsibility for supervision and coordination. In the event of any conflict between the Specifications, the General Conditions and this Schedule E, Schedule E shall take precedence; provided, however, in the event of an omission from Schedule E (i.e., Schedule E omits either a reference to or information concerning an item of work which is set forth in the Specifications or the General Conditions), such omission from Schedule E shall have no effect and the Contractor's obligation to perform the work, as set forth in the Specifications or the General Conditions, shall remain in full force and effect.

Legend: "F" = Furnished "I" = Installed "P" = Provided (Furnished and Installed)

ITEM	Contract #1	Contract #2	Contract #3	Contract #4	Notes
Temporary Heat			P		
Temporary Water		P			
Temporary Light and Power				P	
Temporary Toilets – Enclosures	P				
Temporary Toilets – Fixtures		P			
Rubbish removal from project site	P				
Hoisting and Rigging	P				
Excavation and Backfill					NA
Utility Trenches – inside building					NA
Utility Trenches – outside building					NA
Keeping site, excavations, and building, free from water during construction	P				
Access doors in finished walls and ceilings, panels and ceilings, panels and supporting frames	P				
Field touch-up painting of damaged shop coats	P				

ITEM	Contract #1	Contract #2	Contract #3	Contract #4	Notes
Prime coating hangers and supports	P				
Rust proofing field cut and assemble iron supporting frames and racks	P				
Finished painting of exposed equipment or piping or ductwork on walls and ceilings where adjacent surfaces are painted	P				
Concrete foundations, housekeeping pads or bases for floor mounted equipment not indicated on the contract drawings	P				
Concrete foundations pads and bases, as indicated on contract drawings, for floor mounted equipment	P				
Framed slots and openings in walls, decks, slabs and/or precast concrete planks	P				
Sleeves and core drilling thru slabs, decks and walls whether waterproofed or not	P				
Waterproof sealing of pipes passing thru sleeves and/or slots		P			
Waterproof sealing of sleeves thru membraned and waterproofed slabs, roofs, and decks					NA
Sleeves thru walls with no core drilling required	P				
Roof openings					NA
Louvers – exterior	P				
Louvers – interior	I		F		NA
Roof curbs and roof equipment supports					NA

ITEM	Contract #1	Contract #2	Contract #3	Contract #4	Notes
Pitch pockets					NA
Roof cap flashing for all supports, penetrations and roof curbs					NA
Fireproof sealing of slab openings at duct or pipe shafts	P				
Fire Extinguishers	P				
Prefabricated chimneys					NA
Domestic make-up water piping for heating and air conditioning systems			P		
Pit frames and covers					NA
Drywells					NA
Gas service piping to heating boiler and equipment			P		
Bathroom accessories	P				
Precast and/or molded receptors (mop basins, shower bases, etc.)	P				
Sprinkler water service from street main including meter, to capped OS&Y valve connection inside building					NA
Motors for mechanical equipment			P		
Convactor enclosures	P				
Electric duct heaters (heaters installed in air ducts) and electric unit heaters			P		
Fire and smoke dampers with motors			P		
Control Wiring – General Construction	P				
Control Wiring – Plumbing	P				
Control Wiring – Sprinkler			P		

ITEM	Contract #1	Contract #2	Contract #3	Contract #4	Notes
Control Wiring – HVAC for temperature control			P		
Door Monitoring Systems – Power Wiring				P	
Door Monitoring Systems – Control Wiring	P				
Motor starters and motor controls for equipment requiring power wiring	P				
Power wiring for motorized equipment and motor controls				P	
Electric heating cables for pipe tracing					NA
Concrete encasement of conduits	P				
Electric manholes and handholes					NA
Opening frames for ceiling recessed lighting fixtures and other electrical items	P				

SCHEDULE F

Shop Drawing and Material Samples Schedule

(Reference: Article 1.41 of the General Conditions)

The Schedule set forth below lists all submittal requirements for the Contract. In the event of any conflict between the Specifications and this Schedule F, Schedule F shall take precedence; provided, however, in the event of an omission from Schedule F (i.e., Schedule F omits either a reference to or information concerning a submittal requirement which is set forth in the Specifications), such omission from Schedule F shall have no effect and the Contractor's submittal obligation, as set forth in the Specifications, shall remain in full force and effect.

CONSULTANT: _____ DATE: _____
 TELEPHONE NUMBER: _____
 DDC PROJECT MANAGER: _____ APPROVED: _____
 TELEPHONE NUMBER: _____ (DDC RESIDENT ENGINEER/CPM)

REPORT DATE		FMS ID #/PROJECT ID #/ CONTRACT REGISTRATION #/ PROJECT NAME:			TRADE: SHOP DRAWING LOG SHEET #								USE SEPARATE SHEET FOR EACH TRADE							
SPEC. SECT. #	DESCRIPTION	COORD. WITH CONTR.	SUBMITTAL			SUB. DATE	REQ'D DEL.	FABRIC. TIME	SUBMISSIONS											
			SHOP DWG.	SAMPLE	CAT. CUTS				REC'D	RET'D	ACTION	REC'D	RET'D	ACTION	REC'D	RET'D	ACTION			
015150	Construction IAQ Requirements																			
024119	Selective Demolition	✓																		
033000	Cast-in-Place Concrete	✓	✓	✓																
035416	Hydraulic Cement Underlayment	✓		✓																
042000	Unit Masonry	✓	✓	✓																
051200	Structural Steel Framing	✓		✓																
033100	Steel Decking	✓		✓																
055000	Metal Fabrications	✓		✓																
055100	Metal Stairs	✓		✓																

SCHEDULE F CONTINUED

REPORT DATE		FMS ID #/PROJECT ID #: CONTRACT REGISTRATION #: PROJECT NAME:				TRADE: SHOP DRAWING LOG SHEET #						USE SEPARATE SHEET FOR EACH TRADE							
SPEC. SECT. #	DESCRIPTION	COORD. WITH CONTR.	SUBMITTAL		SUB. DATE	REQ'D DEL.	FABRIC. TIME	SUBMISSIONS											
			SHOP DWG.	SAMPLE				CAT. CUTS	REC'D	RET'D	ACTION	REC'D	RET'D	ACTION	REC'D	RET'D	ACTION		
057000	Decorative Metal		✓	✓															
057113	Fabricated Metal Spiral Stairs		✓	✓															
057300	Handrails and Railings		✓	✓															
061000	Rough Carpentry																		
064023	Interior Architectural Woodwork		✓	✓															
078123	Interior Intumescent Fireproofing		✓	✓															
078413	Penetration Firestopping		✓																
079200	Joint Sealants			✓															
081113	Hollow Metal Doors and Frames		✓	✓															
081416	Wood Doors		✓	✓															
083113	Access Doors and Frames		✓	✓															
083473	Sound Control Door Assemblies		✓	✓															
083513	Aluminum Framed Sliding Wall System		✓	✓															
084113	Interior Aluminum Storefronts		✓	✓															
085113	Interior Aluminum Windows		✓	✓															
087100	Door Hardware		✓	✓															

SCHEDULE F CONTINUED

USE SEPARATE SHEET FOR EACH TRADE

FMS ID #/PROJECT ID #:
CONTRACT REGISTRATION #:
PROJECT NAME:

TRADE:
SHOP DRAWING LOG SHEET #

SUBMISSIONS

SPEC. SECT. #	DESCRIPTION	COORD. WITH CONTR.	SUBMITTAL			SUB. DATE	REQ'D DEL.	FABRIC. TIME	SUBMISSIONS														
			SHOP DWG.	SAMPLE	CAT. CUTS				REC'D	RET'D	ACTION	REC'D	RET'D	ACTION	REC'D	RET'D	ACTION						
088000	Glazing			✓	✓																		
089000	Louvers		✓	✓	✓																		
092900	Gypsum Board Assemblies			✓	✓																		
093100	Tiling		✓	✓	✓																		
095425	Wood Ceilings		✓	✓	✓																		
096440	Sprung Wood Flooring		✓	✓	✓																		
096513	Resilient Flooring		✓	✓	✓																		
096813	Tile Carpeting		✓	✓	✓																		
097200	Wall Coverings		✓	✓	✓																		
097723	Fabric Wrapped Wall Panels		✓	✓	✓																		
098436	Sound Absorbing Ceiling Units		✓	✓	✓																		
099100	Painting			✓	✓																		
101200	Display Cases		✓	✓	✓																		
101400	Signage		✓	✓	✓																		
102113	Toilet Compartments		✓	✓	✓																		
102800	Toilet Accessories			✓	✓																		
104400	Fire Protection Specialties		✓		✓																		
113100	Appliances			✓	✓																		

SCHEDULE F CONTINUED

REPORT DATE		FMS ID #/PROJECT ID #: CONTRACT REGISTRATION #: PROJECT NAME:				TRADE: SHOP DRAWING LOG SHEET #													
SPEC SECT. #	DESCRIPTION	COORD. WITH CONTR.	SUBMITTAL		SUB. DATE	REQ'D DEL.	FABRIC. TIME	SUBMISSIONS											
			SHOP DWG.	SAMPLE				CAT. CUTS	REC'D	RET'D	ACTION	REC'D	RET'D	ACTION	REC'D	RET'D	ACTION		
116123	Performance Platforms		✓																
116143	Performance Draperies		✓	✓															
116151	Performance Pipe Grid		✓																
116191	Performance Lighting Instruments and Accessories		✓																
122413	Roller Window Shades		✓	✓															
124813	Entrance Floor Mats and Frames		✓	✓															
126211	Portable Audience Seating			✓															
142400	Hydraulic Elevators		✓	✓															
144200	Wheelchair Lifts		✓	✓															
210548	Vibration and Seismic Controls for Fire-Suppression Piping and Equipment 1.5. A																		
211200	Fire-Suppression Standpipes 1.6. A & B		✓																
211313	Wet-Pipe Sprinkler Systems 1.6. A & C		✓																

SCHEDULE F CONTINUED

REPORT DATE			FMS ID #/PROJECT ID #: CONTRACT REGISTRATION #: PROJECT NAME:				TRADE: SHOP DRAWING LOG SHEET #				USE SEPARATE SHEET FOR EACH TRADE									
SPEC. SECT. #	DESCRIPTION	COORD. WITH CONTR.	SUBMITTAL		SUB. DATE	REQ'D DEL.	FABRIC. TIME	SUBMISSIONS												
			SHOP DWG.	SAMPLE				CAT. CUTS	REC'D	RET'D	ACTION	REC'D	RET'D	ACTION						
220500	Common Work Results for Plumbing 1.3, A																			
220523	1.3, A																			
220529	Hangers and Supports for Plumbing Piping and Equipment 1.5, A & B		✓																	
220548	Vibration and Seismic Controls for Plumbing Piping and Equipment 1.5, A & C		✓																	
220553	Identification for Plumbing Piping and Equipment 1.3, A & B,			✓																
220700	Plumbing Insulation 1.3, A & C & D		✓																	
221116	Domestic Water Piping 1.3, A																			
221119	Domestic Water Piping Specialties 1.4, A & B		✓																	
221316	Sanitary Waste and Vent Piping 1.4, A & C		✓																	

SCHEDULE F CONTINUED

REPORT DATE		FMS ID #/PROJECT ID #: CONTRACT REGISTRATION #: PROJECT NAME:			TRADE: SHOP DRAWING LOG SHEET #															
SPEC. SECT. #	DESCRIPTION	COORD. WITH CONTR.	SUBMITTAL			SUB. DATE	REQ'D DEL.	FABRIC. TIME	SUBMISSIONS											
			SHOP DWG.	SAMPLE	CAT. CUTS				REC'D	RET'D	ACTION	REC'D	RET'D	ACTION	REC'D	RET'D	ACTION			
221319	Sanitary Waste Piping Specialties 1.3, A & B		✓		✓															
223300	Electric Domestic Water Heaters 1.3, A & C		✓		✓															
224000	Plumbing Fixtures 1.4, A & C		✓		✓															
230500	Common Work Results for HVAC 1.4, A				✓															
230519	Meters and Gages for HVAC Piping 1.4, A & B		✓		✓															
230523	General-Duty Valves for HVAC Piping 1.4, A				✓															
230529	Hangers and Supports for HVAC Piping and Equipment 1.5, A & B		✓		✓															
230548	Vibration and Seismic Controls for HVAC Piping and Equipment 1.5, A				✓															
230553	Identification for HVAC Piping and Equipment 1.3, A & B				✓															
230700	HVAC Insulation 1.4, A				✓															

USE SEPARATE SHEET FOR EACH TRADE

SCHEDULE F CONTINUED

USE SEPARATE SHEET FOR EACH TRADE

TRADE:
SHOP DRAWING LOG SHEET #

FMS ID #/PROJECT ID #:
CONTRACT REGISTRATION #:
PROJECT NAME:

SPEC. SECT. #	DESCRIPTION	COORD. WITH CONTR.	SUBMITTAL			SUB. DATE	REQ'D DEL.	FABRIC. TIME	SUBMISSIONS													
			SHOP DWG.	SAMPLE	CAT. CUTS				REC'D	RET'D	ACTION	REC'D	RET'D	ACTION	REC'D	RET'D	ACTION					
230900	Instrumentation and Control for HVAC 1.6, A & B & C		✓	✓	✓																	
232113	Hydronic Piping 1.4, A & B		✓		✓																	
233113	Metal Ducts 1.4, A & B		✓		✓																	
233300	Air Duct Accessories 1.3, A & B		✓		✓																	
233713	Diffusers, Registers, and Grilles 1.3, A & B & C		✓	✓																		
238219	Fan Coil Units 1.3, A & B & E & F		✓	✓	✓																	
238233	Convectors 1.3, A & B & D & E		✓	✓	✓																	
238239	Unit Heaters 1.3, A & B & D & E		✓	✓	✓																	
260548	Vibration and Seismic Controls for Electrical Systems 1.3, A				✓																	
260553	Identification for Electrical Systems 1.3, A				✓																	
260923	Lighting Control Devices 1.4, A & B		✓		✓																	
260943	Network Lighting Controls 1.4, A & B		✓		✓																	

SCHEDULE F CONTINUED

REPORT DATE

FMS ID #/PROJECT ID #:
CONTRACT REGISTRATION #:
PROJECT NAME:

USE SEPARATE SHEET FOR EACH TRADE

TRADE:
SHOP DRAWING LOG SHEET #

SPEC. SECT. #	DESCRIPTION	COORD. WITH CONTR.	SUBMITTAL			REQ'D DEL.	FABRIC. TIME	SUBMISSIONS											
			SHOP DWG.	SAMPLE	CAT. CUTS			REC'D	RET'D	ACTION	REC'D	RET'D	ACTION	REC'D	RET'D	ACTION			
262200	Low Voltage Distribution Transformers 1.3, A		✓		✓														
262413	Switchboards 1.3, A & B & D		✓	✓	✓														
262726	Wiring Devices 1.4, A & B & C		✓	✓	✓														
262813	Fuses 1.3, A				✓														
262816	Enclosed Switches and Circuit Breakers 1.4, A & B		✓		✓														
262913	Enclosed Controllers 1.3, A & B		✓		✓														
262923	Variable Frequency Motor Controllers 1.2, A				✓														
263353	Static Uninterruptible Power Supply 1.4, A & B		✓		✓														
264313	Transient-Voltage Suppression for Low-Voltage Electrical Power Circuits 1.4, A & B				✓														
265100	Interior Lighting 1.4, A & B		✓		✓														
266111	Performance Dimming and Control 1.5, B		✓		✓														

SCHEDULE F CONTINUED

USE SEPARATE SHEET FOR EACH TRADE

REPORT DATE		FMS ID #/PROJECT ID #: CONTRACT REGISTRATION #: PROJECT NAME:				TRADE: SHOP DRAWING LOG SHEET #														
SPEC. SECT. #	DESCRIPTION	COORD. WITH CONTR.	SUBMITTAL		SUB. DATE	REQ'D DEL.	FABRIC. TIME	SUBMISSIONS												
			SHOP DWG.	SAMPLE				CAT. CUTS	REC'D	RET'D	ACTION	REC'D	RET'D	ACTION						
270500	Common Work Results for Communications 1.6, A & B		✓																	
270526	Grounding and Bonding for Communications Systems 1.02, B & C		✓																	
270553	Identification for Telecommunications Systems 1.2, A																			
271116	Telecommunications Cabinets, Racks, Frames and Enclosures 1.2, A & B		✓																	
271323	Telecommunications Optical Fiber Backbone Cabling 1.4, A & B		✓																	
271500	Telecommunications Horizontal Cabling 1.4, A & B & C		✓																	
274116	Audio and Audiovisual Systems 1.5, C 1.6, B		✓																	
280000	Common Work Results for Elect. Security PART 2, H.1, H.2		✓																	

SCHEDULE F CONTINUED

USE SEPARATE SHEET FOR EACH TRADE

TRADE:
SHOP DRAWING LOG SHEET #

FMS ID #/PROJECT ID #:
CONTRACT REGISTRATION #:
PROJECT NAME:

SPEC. SECT. #	DESCRIPTION	COORD. WITH CONTR.	SUBMITTAL			SUB. DATE	REQ'D DEL.	FABRIC. TIME	SUBMISSIONS															
			SHOP DWG.	SAMPLE	CAT. CUTS				RECD	RET'D	ACTION	REC'D	RET'D	ACTION	REC'D	RET'D	ACTION							
283000	Security Intercommunications System (SIS)																							
283111	Fire Alarm System 1.5, A & B & C			✓																				

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END OF SECTION

**CONTRACT # 1
GENERAL CONSTRUCTION WORK**

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SECTION 010150 - VOLATILE ORGANIC COMPOUND (VOC) LIMITS FOR ADHESIVES, SEALANTS, PAINTS AND COATINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes requirements for volatile organic compound (VOC) content in adhesives, sealants, paints and coatings used for the project.

1.2 RELATED SECTIONS

- A. All sections in the Specifications with adhesive, sealant or sealant primer applications. "LEED BUILDING Submittal Requirements" shall be followed.
- B. Division 9 Section "Painting".

1.3 GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the environmental goals.

1.4 REFERENCES

- A. Rule 1168 - "Adhesive and Sealant Applications", amended 7 January 2005: South Coast Air Quality Management District (SCAQMD), State of California, www.aqmd.gov
- B. Rule 1113 - "Architectural Coatings", amended 9 July 2004: South Coast Air Quality Management District (SCAQMD), State of California, www.aqmd.gov
- C. Green Seal Standard GS-11- "Paints", of Green Seal, Inc., Washington, DC, www.greenseal.org
- D. Green Seal Standard GC-03- "Anti-Corrosive Paints", of Green Seal, Inc., Washington, DC, www.greenseal.org

1.5 VOC REQUIREMENTS FOR INTERIOR ADHESIVES

- A. The volatile organic compound (VOC) content of adhesives, adhesive bonding primers, or adhesive primers used in this project shall not exceed the limits defined in Rule 1168 - "Adhesive and Sealant Applications" of the South Coast Air Quality Management District (SCAQMD), of the State of California.
- B. The VOC limits defined by SCAQMD are as follows. All VOC limits are defined in grams per liter, less water and less exempt compounds.
- C. Unless otherwise specified below, the VOC content of all adhesives, adhesive bonding primers, or adhesive primers shall not be in excess of 250 grams per liter.

D. For specified building construction related applications, the allowable VOC content is as follows:

1. Architectural Applications:	
Indoor carpet adhesive	50
Carpet pad adhesive	50
Wood flooring adhesive	100
Subfloor adhesive	50
Ceramic tile adhesive	65
Drywall and panel adhesive	50
Cove base adhesive	50
Multipurpose construction adhesive	70
2. Specialty Applications:	
PVC welding	510
CPVC welding	490
ABS welding	325
Plastic cement welding	250
Adhesive primer for plastic	550
Contact Adhesive	80
Special Purpose Contact Adhesive	250
Structural Wood Member Adhesive	140
Sheet Applied Rubber Lining Operations	850
Top & Trim Adhesives	250
3. Substrate Specific Applications:	
Metal to metal	30
Plastic foams	50
Porous material (except wood)	50
Wood	30
Fiberglass	80

1.06 VOC REQUIREMENTS FOR INTERIOR SEALANTS

A. The volatile organic compound (VOC) content of sealants, or sealant primers used in this project shall not exceed the limits defined in Rule 1168 – "Adhesive and Sealant Applications" of the South Coast Air Quality Management District (SCAQMD), of the State of California.

B. The VOC limits defined by SCAQMD are as follows. All VOC limits are defined in grams per liter, less water and less exempt compounds.

1. Sealants:	
Architectural	250
Other (including duct)	420
2. Sealant Primer:	
Architectural – Nonporous	250
Architectural – Porous	775
Other	750

1.07 VOC REQUIREMENTS FOR INTERIOR PAINTS

A. Paints and Primers:

Paints and primers used in non-specialized interior applications (i.e., for wallboard, plaster, wood, metal doors and frames, etc.) shall meet the VOC limitations of the Green Seal Paint Standard GS-11, of Green Seal, Inc., Washington, DC. Product-specific environmental requirements are as follows:

1. Volatile Organic Compounds:

- a. The VOC concentrations (in grams per liter) of the product shall not exceed those listed below as determined by U. S. Environmental Protection Agency (EPA) Reference Test Method 24.

Interior Paints and Primers:

Non-flat: 150 g/l

Flat: 50 g/l

The calculation of VOC shall exclude water and tinting color added at the point of sale.

B. Anti-Corrosive and Anti-Rust Paints

Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates shall meet the VOC limitations of the Green Seal Paint Standard GC-03, of Green Seal, Inc., Washington, DC. Product-specific environmental requirements are as follows:

1. Volatile Organic Compounds:

- a. The VOC concentrations (in grams per liter) of the product shall not exceed those listed below as determined by U. S. Environmental Protection Agency (EPA) Reference Test Method 24.

Anti-Corrosive and Anti-Rust Paints:

250 g/l

The calculation of VOC shall exclude water and tinting color added at the point of sale.

1.08 VOC REQUIREMENTS FOR INTERIOR COATINGS

- A. Clear wood finishes, floor coatings, stains, sealers, and shellacs applied to the interior shall meet the VOC limitations defined in Rule 1113, "Architectural Coatings" of SCAQMD, of the State of California. The VOC limits defined by SCAQMD, based on 7/9/04 amendments, are as follows. VOC limits are defined in grams per liter, less water and less exempt compounds.

1. Clear Wood Finishes	
Varnish	350
Sanding Sealers	350
Lacquer	550
2. Shellac	
Clear	730
Pigmented	550
3. Stains	250
4. Floor Coatings	100
5. Waterproofing Sealers	250
6. Sanding Sealers	275

7. Other Sealers

200

The calculation of VOC shall exclude water and tinting color added at the point of sale

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION – Not Used

END OF SECTION 010150

SECTION 013520 – SUSTAINABLE DESIGN REQUIREMENTS (LEED BUILDING)

PART 1 - GENERAL

1.1 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.
- B. Related Sections:
1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
 2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
 3. Division 1 Section "Construction IAQ Requirements".
 4. Division 1 Section "General Commissioning Requirements".

1.2 DEFINITIONS

- A. LEED: The Leadership in Energy & Environmental Design rating system developed by the United States Green Building Council. LEED for New Construction (NC), Version 2.2, is the rating system used for this project.
- B. Recycled Content: The percentage by weight of constituents that have been recovered or otherwise diverted from the solid waste stream, either during the manufacturing process (pre-consumer), or after consumer use (post-consumer).
1. Spills and scraps from the original manufacturing process that are combined with other constituents after a minimal amount of reprocessing for use in further production of the same product are not recycled materials.
 2. Discarded materials from one manufacturing process that are used as constituents in another manufacturing process are pre-consumer recycled materials.

1.3 LEED PROVISIONS

- A. The provisions to achieve a LEED rating are integrated within the project construction documents and specifications. Contractors are specifically directed to the "LEED BUILDING Performance Criteria" and "LEED BUILDING Submittals" sections within each specification. Additional LEED requirements are met through aspects of the project design, including material and equipment selections, which may not be specifically identified as LEED BUILDING requirements. Compliance with the requirements needed to obtain LEED prerequisites and credits will be used as one criterion to evaluate substitution requests.
- B. A LEED Scorecard, which summarizes the targeted LEED points for this project, is included as an attachment to this section. The scorecard is provided for the contractor's reference only.

1.4 LEED BUILDING SUBMITTALS

- A. **Scope:** LEED BUILDING Submittals are required for all installed materials included under Divisions 2 through 14 of this specification. For specification Divisions 21 and 28, LEED BUILDING Submittals are only required for field-applied adhesives, sealants, paints and coatings.
- B. **Applicability:** The extent of the LEED BUILDING Submittals varies depending on the specification section; applicable LEED BUILDING Submittals are listed under the "LEED BUILDING Submittals" heading in each section. The detailed requirements for the LEED BUILDING Submittals are defined in Item C below.
- C. **Detailed Requirements:** Items 1-8 below define the information and documents to be provided for each type of LEED BUILDING Submittal.
1. **ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM (EBMCF):** Information to be supplied for this form (blank copy attached at end of this Section) shall include some or all of the following items, as identified in the LEED Submittal Requirements of each specification section:
 - a) Cost breakdowns for the materials included in the contractor or sub-contractor's scope of work. Cost reporting shall include itemized material costs (excluding the contractor's labor, equipment, overhead and profit).
 - b) The percentages (by weight) of post-consumer and/or post-industrial recycled content in the supplied product(s).
 - c) Volatile Organic Compound (VOC) content of all field-applied adhesives, sealants, paints, and coatings, listed in grams/liter or lbs./gallon.
 2. **EBMCF BACK-UP DOCUMENTATION:** These documents are used to validate the information provided on the EBMCF (except cost data). For each material listed on the EBMCF, provide documentation to certify the material's LEED BUILDING attributes, as applicable:
 - a) Recycled content: Provide published product literature or letter of certification on the manufacturer's letterhead certifying the amounts of post-consumer and/or post-industrial content.
 - b) VOC content: Provide Material Safety Data Sheets (MSDS) certifying the Volatile Organic Compound (VOC) content of the adhesive, sealant, paint, or coating products. VOC content is to be reported in grams/liter or lbs./gallon. If the MSDS does not show the product's VOC content, this information must be provided through other published product literature from the manufacturer, or stated in a letter of certification from the product manufacturer on the manufacturer's letterhead.
 3. **PRODUCT CUT SHEETS:** Provide product cut sheets with the Contractor's or sub-contractor's stamp, confirming that the submitted products are the products installed in the Project.
 4. **CRI GREEN LABEL PLUS CERTIFICATION:** For carpets and carpet cushions, provide published product literature or letter from the manufacturer (on the manufacturer's letterhead) verifying that the products comply with the "Green Label Plus" IAQ testing program of the Carpet and Rug Institute of Dalton, GA.

5. **CERTIFICATION OF COMPOSITE WOOD OR AGRIFIBER RESINS:** For all composite wood, engineered wood and agrifiber products (including plywood, particleboard, and medium density fiberboard), provide published product literature or letter from the manufacturer (on the manufacturer's letterhead) verifying that that the products do not contain added urea-formaldehyde resins.
 6. **CERTIFICATION OF COMPOSITE WOOD OR AGRIFIBER LAMINATING ADHESIVES:** For all laminating adhesives used with composite wood, engineered wood and agrifiber products (e.g., adhesives used to laminate wood veneers to an engineered wood substrate), provide published product literature or letter from the manufacturer (on the manufacturer's letterhead) verifying that that the adhesive products do not contain urea-formaldehyde.
 7. **GREEN SEAL COMPLIANCE:** Provide published product literature or letter from the manufacturer (on the manufacturer's letterhead) verifying that the following product types comply with the VOC limits and chemical component restrictions developed by the Green Seal organization of Washington, DC:
 - a. Topcoat paints: refer to Green Seal standard GS-11 (1st edition, May 1993)
 - b. Anti-corrosive and Anti-rust paints: refer to Green Seal standard GC-03 (2nd Edition, January 1997)
 - c. Aerosol Adhesives: refer to Green Seal standard GS-36 (1st edition, October 2000)
- D. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review. Incomplete or inaccurate LEED BUILDING submittals may be used as the basis for the Commissioner's rejection of products or assemblies. Incomplete or inaccurate LEED BUILDING Submittals may be used as the basis for rejecting the submitted products or assemblies.
- E. LEED Action Plans
1. Construction IAQ Management Plan- Refer to Section 015150, Construction IAQ Requirements, for detailed submittal requirements.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 013520

REPORT DATE		FMS ID #/PROJECT ID #: PV467ANYC CONTRACT REGISTRATION #: PROJECT NAME: ART/NEW YORK THEATRE FIT OUT	LEED REQUIREMENTS Contractor to pursue the following credits under LEED 2009 for Commercial Interiors and submit completed forms and documentation online. Refer to LEED Online (www.leedonline.com).
CREDIT	POINTS	DESCRIPTION	NOTES
ENERGY AND ATMOSPHERE			
EA p1	Prerequisite	Fundamental Commissioning of Building Energy Systems	
EA c2	5	Enhanced Commissioning	
EA c4	5	Green Power	
MATERIALS AND RESOURCES			
MR c2	1	Construction Waste Management	
MR c4	1	Recycled Content	
INDOOR ENVIRONMENTAL QUALITY			
IEQ c3.1	1	Construction IAQ Management Plan – During Construction	
IEQ c3.2	1	Construction IAQ Management Plan – Before Occupancy	
IEQ c4.1	1	Low-Emitting Materials – Adhesives and Sealants	
IEQ c4.2	1	Low-Emitting Materials – Paints and Coatings	
IEQ c4.3	1	Low-Emitting Materials – Flooring Systems	
IEQ c4.4	1	Low-Emitting Materials – Composite Wood and Agrifiber Products	
INDOOR ENVIRONMENTAL QUALITY			
ID c2	1	LEED Accredited Professional	

SECTION 015050 - CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide construction waste management in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following.

1. Waste Management Goals.
2. Waste Management Plan.
3. Progress Reports.
4. Project Meetings.
5. Management Plan Implementation.

1.2 WASTE MANAGEMENT REQUIREMENTS

- A. The City of New York has established that this project shall generate the least amount of waste possible and that processes that ensure the generation of as little waste as possible due to error, inaccurate planning, breakage, mishandling, contamination, or other factors shall be employed.
- B. Of the inevitable waste that is generated, as many of the waste materials as economically feasible, and as stated here, shall be reused, salvaged, or recycled. Waste disposal in landfills shall be minimized.
- C. The City of New York will seek LEED (Leadership in Energy and Environmental Design) certification for this Project, from the U.S. Green Building Council. The documentation required here will be used for this purpose. LEED awards points for a variety of sustainable design measures on a project, one of which is the reuse and recycling of project waste.
- D. Diversion Requirements. A minimum of 50% of total Project demolition and construction waste (by weight) shall be diverted from landfill. The following waste categories are likely candidates to be included in the diversion plan for this project:
1. Concrete.
 2. Masonry.
 3. Metals (e.g. banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized, stainless steel, aluminum, copper, zinc, brass, bronze).
 4. Cardboard, packaging.
 5. Reuse items indicated on the Drawings and/or elsewhere in the Specification.
 6. Other categories are acceptable and might include:
 - a. Clean dimensional wood
 - b. Asphalt shingles or roofing
 - c. Drywall
 - d. Carpet and pad
 - e. Ceiling tiles
 - f. Glass

- E. Recycling on the job, subject to the Commissioner's approval, is encouraged on the site itself, such as the crushing and reuse of removed sound concrete and stone. Include these categories in the Waste Management Plan.

1.3 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash debris and rubble resulting from construction, remodeling repair and demolition operations. Hazardous materials are not included.
- C. Diversion from Landfill: To remove, or have removed, from the site for recycling, reuse or salvage, material that might otherwise be sent to a landfill. Diversion from Landfill does not include using the material as alternative daily cover at a landfill site, nor does it include burning, incinerating or thermally destroying waste.
- D. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product.
- E. Recycle (recycling): To sort, separate, process, treat or reconstitute solid waste and other discarded materials for the purpose of redirecting such materials into the manufacture of useful products. Recycling does not include burning, incinerating or thermally destroying waste.
- F. Return: To give back reusable items or unused products to vendors.
- G. Reuse: To reuse excess or discarded construction material in some manner on the Project site.
- H. Salvage: To remove a waste material from the Project site for resale or reuse.
- I. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable and reusable material.
- J. Waste Management Plan: A project-related plan for the collection, transportation and disposal of waste generated at the construction site. The purpose of the plan is to ultimately reduce the amount of material becoming landfill.

1.4 REFERENCES, RESOURCES

- A. DDC encourages its contractors to seek information from websites and experts in salvage or recycling in order to minimize disposal costs. There are numerous opportunities to sell salvage, or to donate salvage and accrue tax benefits (which would accrue to the contractor); also there are outlets that will pick up, and in some cases buy recyclable materials. Examples of information resources are as follows:
 - 1. Outlets. For assistance in finding outlets for specific materials on specific projects, one possible source is New York Wa\$teMatch. Email: wastematch@itac.org Telephone: 212-442-5219.

2. DDC's Sustainable Design web site: <http://www.nyc.gov/html/ddc/html/ddcgreen> This includes a manual on Construction and Demolition Waste Reduction and Recycling, a Sample Waste Management Plan and a list of internet resources.
3. Directory of Construction and Demolition Waste Processors. A list of local recycling processors is available from New York City Department of Design and Construction, Office of Sustainable Design. DDC's consultants and contractors can request this list by contacting greeninfo@ddc.nyc.gov. This list is provided for information only and is not necessarily comprehensive; other haulers and markets are acceptable.
4. Web Resources (Information only; no warranty or endorsement is implied):
 - a. www.wastematch.org Site of New York Wa\$te Match, a materials exchange database and service.
 - b. www.usgbc.org Site of the United States Green Building Council, with a description of the LEED certification process and requirements for C&D waste recycling.
 - c. <http://www.epa.gov/epaoswer/non-hw/debris-new> Site of the U.S. Environmental Protection Agency that discusses construction and demolition waste issues, and links to other resources.

1.5 SUBMITTALS

- A. The Contractor for General Construction Work shall be responsible for the development and implementation of a Waste Management Plan for the Project. All Prime Contractors shall assist in the development of that Plan, and collect, sort and deposit their waste and recyclable materials in accordance with the approved Plan.
- B. Draft Waste Management Plan. Within 7 days after receipt of Notice to Proceed, or prior to any waste removal, whichever occurs sooner, the Contractor for General Construction Work shall submit to the Commissioner a Draft Waste Management Plan. The Draft Plan shall contain the following:
 1. Estimate of the total proposed jobsite waste to be generated, including types and quantities.
 2. Proposed alternatives to Landfilling: A list of each material proposed to be salvaged, reused, or recycled during the course of the Project, the proposed destination for each material, and the projected amount (by weight or cu.-yd).
- C. Final Waste Management Plan. Within 7 days of Commissioner's approval of the Draft Plan, the Contractor for General Construction Work shall submit a Final Waste Management Plan. It shall contain the following:
 1. Estimate of the total proposed jobsite waste to be generated, including types and quantities.
 2. Proposed alternatives to Landfilling: A list of each material proposed to be salvaged, reused, or recycled during the course of the Project, the proposed destination for each material, and the projected amount (by weight or cu.-yd).
 3. Materials handling procedures. A description of the means by which any waste materials identified in item (2) above will be protected from contamination, and a description of the means to be employed in recycling the above materials consistent with the requirements for acceptance by recycling processors to be utilized.
 4. List of documentation to be provided in Progress Reports.

1.6 PROGRESS REPORTS

- A. The Contractor for General Construction Work shall submit monthly a Waste Management Progress Report, containing the following information:
1. Project title, name of company completing report, and dates of period covered by the report.
 2. Report on the disposal of all jobsite waste, including:
 - a. Recycled materials. For each material, provide the following:
 - 1) Amount (in tons or cubic yards).
 - 2) Dates removed from the jobsite.
 - 3) Receiving Party.
 - b. Reused or salvaged materials. For each material, provide the following:
 - 1) Amount (in tons or cubic yards).
 - 2) Description of intended or actual use.
 - c. Landfilled materials. Provide the following:
 - 1) Amount (in tons or cubic yards).
 - 2) Dates removed from the jobsite.
 - 3) Identity of the transfer station or landfill.
- B. Include legible copies of on-site logs, weight tickets and receipts. Receipts shall be from recycling and/or disposal site operators who can legally accept the materials for the purpose of reuse, recycling or disposal. If mixed construction and demolition waste is sorted off-site, provide a letter from the processor stating the average percentage of mixed C&D waste they recycle. Contractor shall save such original documents (as above) for the life of the project plus number of years as agreed upon by the Contractor and DDC.

1.7 PROJECT MEETINGS

- A. Waste management plans and implementation shall be discussed at the following meetings:
1. Pre-demolition meeting.
 2. Pre-construction meeting.
 3. Regular job-site meetings.
 4. Contractor toolbox meetings.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 WASTE MANAGEMENT PLAN EXECUTION

- A. The Contractor for General Construction Work shall be responsible for the provision of containers and the removal of all waste, non-returned surplus materials, and rubbish from the site in accordance with the Waste Management Plan. The Contractor for General Construction Work shall oversee and document the results of the Plan. The Prime Contractors shall be responsible for collecting, sorting, and depositing in designated areas, their waste, non-returned surplus materials, and rubbish, as per the Waste Management Plan. Monies received for recycling materials shall remain with the Contractor for General Construction Work. Monies received for salvaged materials shall remain with the Contractor for General Construction Work, except for those items specifically identified in the specifications, Division 2 Existing Conditions, or indicated on the drawings.
- B. Distribution. The Contractor for General Construction Work shall distribute copies of the Waste Management Plan to each Prime Contractor, Subcontractor, Resident Engineer, Construction Manager, and Commissioner.
- C. Instruction. The Contractor for General Construction Work shall provide on-site instruction of appropriate separation, handling and recycling, salvage, reuse and return methods to be used by all parties in appropriate stages of the Project.
- D. Separation facilities. The Contractor for General Construction Work shall lay out a specific area(s) to facilitate separation of materials for potential recycling, salvage, reuse and return. Each potential material shall be collected and stored to avoid being mixed with other materials. Recycling and waste bin areas are to be kept neat and clean, and clearly marked.

END OF SECTION 015050

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SECTION 015150 - CONSTRUCTION IAQ REQUIREMENTS

PART 1 - GENERAL

1.1 CONSTRUCTION IAQ MANAGEMENT GOALS FOR THE PROJECT

- A. The City of New York has established that this Project shall minimize the detrimental impacts on Indoor Air Quality (IAQ) resulting from construction activities. Factors that contaminate indoor air, such as dust entering HVAC systems and ductwork, improper storage of materials on-site, poor housekeeping, shall be minimized.

1.2 SUMMARY

- A. This Section includes requirements for the development of a Construction Indoor Air Quality Management Plan (alternately referred to as "the Plan"). Develop the Plan for approval by the Commissioner. The Plan shall be implemented throughout the duration of the project construction, and shall be documented as outlined in the Submittal Requirements of Item 1.7 below. The Plan is included as part of the LEED BUILDING requirements for the project.

B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. All sections of the Specifications related to interior construction, MEP systems, and items affecting indoor air quality.
3. Division 9 Section "Painting".

1.3 DEFINITIONS

- A. Volatile Organic Compounds (VOC's): Chemical compounds common in and emitted by many building products, including solvents in paints, coatings, adhesives and sealants, wood preservatives; composite wood binder, and foam insulations. Not all VOC's are harmful, but many of those contained within building products contribute to the formation of smog and may irritate building occupants by their smell and/or health impact.
- B. Materials that act as "sinks" for VOC contamination: Absorptive materials, typically dry and soft (such as textiles, carpeting, acoustical ceiling tiles and gypsum board) that readily absorb VOC's emitted by "source" materials and release them over a prolonged period of time.
- C. Materials that act as "sources" for VOC contamination: Products with high VOC contents that emit VOC's either rapidly during application and curing (typically "wet" products, such as paints, sealants, adhesives, caulks and sealers) or over a prolonged period (typically "dry" products such flooring coverings with plasticizers and engineered wood with formaldehyde)

1.4 REFERENCES AND RESOURCES

- A. "IAQ Guidelines for Occupied Buildings Under Construction", First Edition, November 1995, The Sheet Metal and Air Conditioner Contractors National Association (SMACNA). (703) 803-2980, www.smacna.org.
- B. ANSI/ASHRAE 52.2-1999, "Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size", www.ashrae.org

1.5 LEED BUILDING GENERAL REQUIREMENTS

- A. Implement practices and procedures to meet the project's environmental performance goals, which include achieving LEED Certification. Specific project goals that may impact this area of work include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes compromise the stated LEED BUILDING Performance Criteria.

1.6 CONSTRUCTION IAQ MANAGEMENT PLAN

- A. The Contractor shall prepare and submit a Construction IAQ Management Plan to the Commissioner for approval. The Construction IAQ Management Plan shall meet the following criteria:

1. Construction activities shall be planned to meet or exceed the minimum requirements of the Sheet Metal and Air Conditioning National Contractors' Association (SMACNA) "IAQ Guidelines for Occupied Buildings under Construction", First Edition, 1995
2. Absorptive materials shall be protected from moisture damage when stored on-site and after installation.
3. If air handlers are to be used during construction, filtration with a Minimum Efficiency Reporting Value (MERV) of 8 must be at each return air grill, as determined by ASHRAE 52.2-1999.
4. Filtration media shall be replaced immediately prior to occupancy. Filtration media shall have a Minimum Efficiency Reporting Value (MERV) of 13 as determined by ASHRAE 52.2-1999.
5. A "Sequence of Finish Installation Plan" shall be developed, highlighting measures to reduce the absorption of VOCs by materials that act as "sinks".
6. Upon approval of the Plan by the Commissioner, it shall be implemented through the duration of the construction process, and documented in accordance with the Submittal Requirements of Item 1.08 below.

- B. Further description of the Construction IAQ Management Plan requirements is as follows:

1. SMACNA Guidelines: Chapter 3 of the referenced "IAQ Guidelines for Occupied Buildings Under Construction", outline IAQ measures in five categories as listed below. The Construction IAQ Management Plan shall be organized in accordance with the SMACNA format, and shall address measures to be implemented in each of the five categories (including subsections). All subsections shall be listed in the Plan; items that are not applicable for this project should be listed as such:

a. HVAC Protection:

- 1) Central Filtration
- 2) Supply Side
- 3) Duct Cleaning.

b. Source Control:

- 1) Product Substitution
- 2) Modifying Equipment Operation
- 3) Changing Work Practices
- 4) Local Exhaust

- 5) Air Cleaning
- 6) Cover or Seal

c. Pathway Interruption:

- 1) Depressurize Work Area
- 2) Pressurize Occupied Space
- 3) Erect Barriers to Contain Construction Areas
- 4) Relocate Pollutant Sources
- 5) Temporarily Seal the Building

d. Housekeeping

e. Scheduling

2. Protect of Materials from Moisture Damage: As part of the "Housekeeping" section of the Construction IAQ Management Plan, measures to prevent installed materials or material stored on-site from moisture damage shall be described. This section should also describe measures to be taken if moisture damage does occur to absorptive materials during the course of construction.
3. Replacement of Filtration Media: Under the "HVAC Protection" section of the Construction IAQ Management Plan, a description of the filtration media in all ventilation equipment shall be provided. The description shall include replacement criteria for filtration media during construction, and confirmation of filtration media replacement for all equipment immediately prior to occupancy.
4. Sequence of Finish Installation for Materials: Where feasible, absorptive materials shall be installed after the installation of materials or finishes which have high short-term emissions of VOC's, formaldehyde, particulates, or other air-borne compounds. Absorptive materials include, but are not limited to: carpets; acoustical ceiling panels; fabric wall coverings; insulations (exposed to the airstream); upholstered furnishings; and other woven, fibrous or porous materials. Materials with high short-term emissions include, but are not limited to: adhesives, sealants and glazing compounds (specifically those with petrochemical vehicles or carriers); paints, wood preservatives and finishes; control and/or expansion joint fillers; hard finishes requiring adhesive installation; gypsum board (with associated finish processes and products); and composite or engineered wood products with formaldehyde binders.
5. Implementation and Coordination: Implement the Construction IAQ Management Plan, and coordinate the Plan with all affected trades. Designate one individual as the Construction IAQ Representative, who will be responsible for communicating the progress of the Plan with the Commissioner on a regular basis, and for assembling the required LEED documentation. Include provisions in the Construction IAQ Management Plan for addressing conditions in the field that do not adhere to the Plan, including provisions to implement a stop work order, or to rectify non-compliant conditions.

1.7 SUBMITTALS

The Construction IAQ Representative shall submit the following LEED-required records and documents

- A. A copy of the Construction IAQ Management Plan as defined in this Section.

- B. Product cut-sheets for all filtration media used during construction and installed immediately prior to occupancy, with MERV values highlighted. Cut sheets shall be submitted with the Contactor's or Subcontractor's 'approved' stamp as confirmation that the products are the products installed on the project.
- C. Provide the Commissioner with a minimum of 18 photographs comprising of at least six photographs taken on three different occasions during construction. The photographs shall document the implementation of the Construction IAQ Management Plan throughout the course of the project construction. Examples include photographs of ductwork sealing and protection, temporary ventilation measures, and conditions of on-site materials storage (to prevent moisture damage). Photographs shall include integral date stamping, and shall be submitted with brief descriptions of the Construction IAQ Management Plan measure documented, or be referenced to project meeting minutes or similar project documents which reference to the Construction IAQ Management Plan measure documented

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 BUILDING AIR PURGING (FLUSH OUT)

- A. Purging must be conducted after construction and immediately prior to initial occupancy, for a period of at least two weeks, as follows.
 - 1. After construction ends and with all interior finishes installed, new MERV 13 filtration media is installed and the building is flushed out by supplying 100% outside air for a minimum of two weeks **-OR-** total air volume of 14,000 ft³ of outdoor air per ft² of floor area while maintaining an internal temperature of at least 60° F and, where mechanical cooling is operated, relative humidity no higher than 60%.
 - 2. After flush-out, new MERV 13 filters must replace all filters except those solely processing outside air.

END OF SECTION 015150

SECTION 01 91 00
GENERAL COMMISSIONING REQUIREMENT

PART 1 – GENERAL

1.1 SUMMARY

- A. A Commissioning Agent (CxA), Dome-Tech, Inc., has been contracted to provide building system Commissioning (Cx) services for this project.
- B. The intent of this Specification is to:
 - 1. Familiarize the contractor with the Cx process and differences between a commissioned and "non-commissioned" project.
 - 2. Specify what labor / tasks are required by the contractor (and subcontractors) to support the commissioning effort, so the contractor (and subcontractors) can properly estimate the costs for this work. This specification should not be treated as an isolated document and must be read in conjunction with other related specifications as identified in section 1.4 of this specification.

1.2 DESCRIPTION

- A. Commissioning: Commissioning is a systematic process of ensuring that the building systems, including the mechanical and electrical, systems, have been installed in the prescribed manner, are functionally checked and capable of being operated and maintained to perform with the design intent and have documentation to support proper installation and operation. The Commissioning Agent (CxA) shall provide the Owner with an unbiased, objective view of the system's installation, operation and performance. This process does not eliminate or reduce the responsibility of each system designer to provide a complete design or installing subcontractors to provide a finished product. Commissioning is intended to enhance the quality of each system installation, startup and transfer to beneficial use by the Owner.
- B. Commissioning during the construction phase is intended to achieve the following specific objectives, according to the Contract Documents:
 - 1. Verify that applicable equipment and systems are installed according to the design, contract specification, manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
 - 2. Verify and document proper performance of equipment and systems.
 - 3. Verify that Operation & Maintenance documentation is complete and transferred to Owner.
 - 4. Verify that the Owner's operating personnel are adequately trained.
- C. The Commissioning process shall be a team effort and encompass, as well as coordinate, the traditionally separate functions of system documentation, system installation, equipment startup, control system calibration, testing, balancing and verification and performance checkouts.

- D. The CxA will work closely with the construction team, cooperating on and coordinating all Cx activities with the CM/Owner's representative, Trade Contractors, subcontractors, manufacturers and equipment suppliers.
- E. The Cx process shall not reduce the responsibility of the construction management group (CM/GC) to comply with the Contract Documents.

1.3 **RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, including 'LEED Requirement' apply to this Section.

1.4 **RELATED SPECIFICATION SECTIONS INCLUDE**

- A. Division 23: Mechanical /HVAC specifications
- B. Division 26: Electrical Specifications

1.5 **DEFINITIONS**

- A. The following is a list of definitions utilized with this specification. Other definitions outlined in the General Conditions, Supplementary Conditions, Technical Specifications or other Contract Documents shall remain in effect.
 - 1. Acceptance Phase: Phase of construction after installation completion, startup and initial checkout when functional performance tests, operation and maintenance documentation review and training occur.
 - 2. Approval: Acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the Contract Documents.
 - 3. Architect/Engineer (A/E): The consultants who comprise the design team, generally the Architect, and the MEP (Mechanical/Electrical/Plumbing) Engineer.
 - 4. Check Sheets: The step by step process that must be executed to fulfill the test requirements. The CxA shall develop the check sheets.
 - 5. Commissioning Agent (CxA): The Commissioning Agent is an independent authority, not otherwise associated with the A/E team members, the CM or Trade Contractor. The CxA directs and coordinates commissioning activities. The CxA does not take a project oversight role.
 - 6. Commissioning Plan (CxP): An overall plan developed by the CxA that defines the structure, scope, schedule and coordination planning for the Cx process.
 - 7. Construction Project Manager (CM): The owner's Construction Manager or the authorized representative appointed by the owner.
 - 8. Pre-functional / Installation Checklists (ICs): A list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the CxA to the Subcontractors. Installation checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension correct, oil levels, labels affixed, gages in place, sensors calibrated, etc.). The word installation refers to pre functional testing. Installation checklists augment and are combined with the manufacturer's startup checklist.
 - 9. Contract Documents: The documents binding all concerned involved in the construction of this Project (Drawings, Specifications, Bulletins, Change Orders,

Amendments, other Contracts, Commissioning plans, etc.) as defined in the General Conditions of the Contract.

10. Control System: The central building management control system. (BAS or BMS system)
11. Data Logging: Monitoring flows, currents, status, pressures, etc. of equipment, using standalone data loggers separate from the control system.
12. Functional Checks (FCs): Test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure set-point). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation, and components are verified to be responding as the sequences state. Traditional air or water test and balancing is not functional testing. The Commissioning Authority develops the functional test procedures in a sequential written form. The FCs are generally developed from the approved sequence of operation and control logic in conformance to contract documents. CxA coordinates, oversees, performs / witnesses and documents the actual testing, which is often performed by the installing Contractor or vendor. Function tests are performed after installation checklists and startup are complete.
13. Indirect Indicators: Indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100% closed.
14. Installing Contractor / Subcontractor: Contractor / Subcontractor who installs specific equipment and / or systems.
15. Issue: A condition in the installation or function of a component, piece of equipment or system that is not in compliance or conformance with the Contract Documents.
16. Issues Database: A formal and ongoing record of problems, deficiencies or concerns – and their resolution – that have been raised by members of the Commissioning Team during the course of Cx. 'Issues database' is the primary tracking tool to address all commissioning issues by the concerned parties. All issues must be addressed / closed by the concerned parties before close-out.
17. Manual Test: A test using handheld instruments, immediate control system readouts or direct observation to verify performance (as opposed to analyzing monitored data taken over time to make the "observation").
18. Master Equipment List (MEL): A complete listing of all commissioned building equipment, including detail such as make, model, etc., that is taken from submittals and is the basis from which check sheets will be generated.
19. Monitoring: The recording of parameters (flow, current, status, pressure, etc.) of equipment operation using data loggers or the trending capabilities of control systems.
20. Overwritten Value: Writing over a sensor value in the control system to see the response of a system (e.g., changing the outside air temperature value to verify economizer operation). See also "Simulated Signal".

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21. Owner: City of New York. The owner will appoint / assign a "Commissioner" to represent the 'City of New York' for all necessary work related to the project as well as all verification, certification, selection, approval, etc'.
22. Owner Contracted Tests: Tests paid for by the Owner outside of the CM's Contract and for which the CxA does not provide oversight. These tests will not be repeated during functional tests if properly documented.
23. Owner's Project Requirements (OPR): The Owner's Project Requirements is the documentation of the primary thought processes and assumptions behind design decisions that were made to develop the Basis of Design (BOD and meet the design intent. The OPR describes the systems, components, conditions and methods chosen to meet the intent. Some reiterating of the design intent may be included.
24. Phased Commissioning: For projects that are anticipated to be completed in phases, commissioning that is completed in stages due to the size of the structure or other scheduling issues to minimize total construction time.
25. Sampling: Functional testing for a percent / fraction of the total number of identical or near identical pieces of equipment.
26. Seasonal Performance Tests: Functional tests that are deferred until or performed again when the system(s) will experience climate conditions closer to their design conditions.
27. Startup: The initial starting or activating of equipment, including executing construction checklists.
28. Subcontractors: The subcontractors that provide building components and systems under the General Construction Contractor.
29. Test Requirements: Requirements specifying what modes and functions, etc. shall be tested on any given piece of equipment or any given system (integrated and/or stand-alone). The test requirements are not the detailed test procedures. The test requirements for each system are specified in the respective section of the Contract Documents.
30. Testing, Adjust, Balance (TAB): Primary work is setting up the system flows and pressures as specified whereas functional testing is verifying that which has already been set up.
31. Trending: Monitoring using the building control system.
32. Vendor: Supplier of equipment.

1.6 REFERENCES

- A. General: Comply with the applicable provisions and recommendations of references, except as modified by governing codes and by the Contract Documents. Where a recommendation or suggestion occurs in the references, such recommendation or suggestion shall be considered mandatory. In the event of conflict between references, this specification or within themselves, the more stringent standard or requirement shall govern.
 1. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE): "ASHRAE Guideline 1.1-2007 ASHRAE Guideline HVAC&R Technical Requirements for The Commissioning Process
 2. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE): "ASHRAE Guideline 0-2005 ASHRAE Guideline 'The Commissioning Process'".

1.7 **COMMISSIONING TEAM**

- A. Commissioning Team: The members of the commissioning team consist of the CxA, USER, CM, the Architect and MEP Engineers, the Mechanical Trade Contractor, the Electrical Trade Contractor, the TAB representative (if independently retained), the Temperature Controls Contractor, as well as any other installing subcontractors or suppliers of equipment. The Owner's building or plant operator / engineer shall also be a member of the commissioning team.
- B. Members Appointed by CM: Individuals, each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions. The commissioning team shall consist of, but not be limited to, representatives of each Contractor, including Project superintendent and subcontractors, installers, suppliers and specialists deemed appropriate by the CxA.
- C. Members Appointed by Owner:
 - 1. Commissioning Agent (CxA): The designated person, company or entity that plans, schedules and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
 - 2. Construction Manager (CM)
 - 3. Representatives of the facility user and operation and maintenance personnel.
 - 4. Architect and engineering design professionals.

1.8 **OWNER (City Of New York) RESPONSIBILITIES**

- A. Provide the design and construction documentation to the CxA for use in developing the commissioning plan; systems manual; operation and maintenance training plan; and testing plans and checklists.
- B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities including, but not limited to, the following:
 - 1. Coordination meetings.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
 - 3. Testing meetings.
 - 4. Demonstration of operation of systems, subsystems, and equipment.
- C. Provide the approved Contract Documents to the CxA and CM for use in finalizing the commissioning plan, developing the check sheets, systems manual, and review operation and maintenance training plan.
- D. Appoint a Commissioner to represent the 'City of New York' for all necessary work related to the project and 'Verification, certification, selection, approval etc'.

1.9 **CONSTRUCTION MANAGER'S (CM) RESPONSIBILITIES**

- A. Provide utility services and any consumable required for the commissioning process.
- B. The CM shall assign representatives with expertise and authority to act on behalf of the CM and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:
 - 1. Participate in design and construction phase coordination meetings.

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2. Insert Cx requirements into the master schedule.
3. Participate in maintenance orientation and inspection.
4. Participate in operation and maintenance training sessions.
5. Participate in final review at acceptance meeting.
6. Certify that Work is complete and systems are operational according to the Contract Documents, including calibration of instrumentation and controls. Notify the CxA when issues have been resolved.
7. Schedule testing, training, and provide a minimum of 48 hours notice to CxA for witnessing the testing.
8. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
9. Review and approve final commissioning documentation.

1.10 GC/SUB CONTRACTOR'S RESPONSIBILITIES

- A. Subcontractors shall assign representatives with expertise and authority to act on behalf of subcontractors and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:
1. Participate in construction phase coordination meetings.
 2. Demonstrate all sequences to CxA.
 3. Participate in maintenance orientation and inspection.
 4. Participate in procedures meeting for testing.
 5. Execute Installation check sheets.
 6. Support functional testing with qualified technicians.
 7. Respond to Cx Issues Database within seven days of publication of issue.
 8. Participate in final review at acceptance meeting.
 9. Provide schedule for operation and maintenance data submittals, equipment startup, and testing to CxA for incorporation into the commissioning plan. Update schedule on a weekly basis throughout the construction period.
 10. Provide information to the CxA for developing construction phase commissioning plan.
 11. Co-ordinate / Conduct training sessions for Owner's operation and maintenance personnel.
 12. Provide updated Project Record Documents to the CxA on a daily / weekly basis.
 13. Gather and submit operation and maintenance data for systems, subsystems and equipment to the CxA 45 days after acceptance.
 14. Provide technicians who are familiar with the construction and operation of installed systems and who shall develop specific test procedures and participate in testing of installed systems, subsystems and equipment.

1.11 COMMISSIONING AGENT'S (CxA) RESPONSIBILITIES

- A. The functions and responsibility of the CxA shall include:

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1. Organization and leadership of the Commissioning team with primary responsibility to inform the Owner and CM on the status, integration, and performance of systems within the facility.
 2. Preparation of construction-phase commissioning plan and collaboration with CM and appropriate subcontractors and suppliers to develop commissioning procedures.
 3. Scheduling: The CxA shall work with the CM according to established protocols to schedule the commissioning activities. Identification of commissioning team member responsibilities by name, firm and trade specialty for performance of each commissioning task.
 4. At the beginning of the construction phase, conduct an initial construction phase coordination meeting for the purpose of reviewing the commissioning activities and establishing tentative schedules for operation and maintenance submittals; operation and maintenance training sessions; testing, adjusting and balancing work; and Project completion.
 5. Observation of Tests: CxA shall prepare, schedule (with the CM), coordinate, direct, witness and document Project specific tests, inspections, checkout and certain startup procedures (performed by the contractors) as required to ensure equipment and system installation, operation and performance meets the design intent. The CxA shall provide technical inputs to oversee and verify the correction of open issues found during the commissioning process.
 6. Compile test data, inspection reports and certificates and include them in the commissioning report.
 7. Review Project Record Documents for accuracy. Request revisions from CM to achieve accuracy.
 8. Review subcontractor submitted O&M & training documentation.
 9. Prepare commissioning reports.
 10. Assembly of the final commissioning documentation.
- B. The CxA is referred to as an independent contractor in this Section and shall work under a separate contract directly for the Owner. The CxA shall not be financially associated with any of the work of the contractors or subcontractors on this project to avoid potential conflicts of interest.

1.12 COMMISSIONING DOCUMENTATION (the definitions are already covered under 1.5)

- A. Commissioning Plan: The commissioning plan is a living document that will evolve over the course of the project and ultimately include,:
1. Description of the organization, layout and content of commissioning documentation and a detailed description of documents to be provided along with identification of responsible parties.
 2. Identification of systems and equipment to be commissioned.
 3. Description of schedules for testing procedures along with identification of parties involved in performing and verifying tests.
 4. Identification of items that must be completed before the next operation can proceed.
 5. Description of responsibilities of commissioning team members.

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6. Description of observations to be made.
 7. Schedule for commissioning activities
- B. Pre-functional check / Installation Checks (IC):
- C. Functional Checks (FC): The end goal is that all associated equipment and components are verified simultaneously to ensure that all elements operate as per the contract documents. Each checklist, regardless of system, subsystem or equipment being tested, shall include, but not limited to, the following:
1. Name and tag of tested item.
 2. Date of test.
 3. Indication of whether the record is for a first test or retest following correction of a problem or issue.
 4. Dated signatures of the person performing test and of the witness if applicable.
 5. Deficiencies.
 6. Issues, if any, generated as the result of test in the note section
- D. Test and Inspection Reports: CxA shall record test data, observations and measurements on test checklists.
- E. Corrective Action Documents: CxA shall document corrective action taken for systems and equipment that fail tests. Include required modifications to systems and equipment and revisions to test procedures, if any. Retest systems and equipment requiring corrective action and document retest results.
- F. Issues Database: CxA shall prepare and maintain an issues database that describes design, installation and performance issues that are at variance with the OPR, BOD and Contract Documents. Identify and track issues as they are encountered, documenting the status of unresolved and resolved issues.
1. Documenting Issue Resolution:
 - a. Log date correction is completed or the issue is resolved.
 - b. Describe corrective action or resolution taken. Include description of diagnostic steps taken to determine root cause of the issue if any.
 - c. Identify changes to the Owner's Project Requirements, Basis of Design, or Contract Documents that may require action.
 - d. State that correction was completed and system, subsystem and equipment is ready for retest if applicable.
 - e. Identify person(s) who corrected or resolved the issue.
 - f. Identify person(s) documenting the issue resolution.
- G. Commissioning Report: CxA shall document results of the commissioning process including unresolved issues and performance of systems, subsystems and equipment. The commissioning report shall indicate whether systems, subsystems and equipment have been completed and are performing according to the Owner's Project Requirements, Basis of Design and Contract Documents. The commissioning report shall include the following:
1. Lists and explanations of substitutions; compromises; variances in the Owner's Project Requirements, Basis of Design and Contract Documents; record of

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conditions; and, if appropriate, recommendations for resolution. It may also include a recommendation for accepting or rejecting systems, subsystems, and equipment.

2. Owner's Project Requirements and Basis of Design documentation.
3. Commissioning plan.
4. Testing plans and reports.
5. Corrective modification documentation.
6. Issues database.
7. Completed functional check sheets.
8. Listing of any seasonal test(s) remaining and a schedule for their completion.

1.13 SUBMITTALS

- A. Commissioning Plans: Submit to Owner and Architect
- B. Testing: Submit to Owner and Architect
 1. Functional Checklists and Report Forms: CxA shall submit Prefunctional and functional test procedures to CM, A/E for review, comment, and distribution.
 2. Test and Inspection Reports: Submit for Owner and Architect's information. CxA shall submit test and inspection reports.
- C. Corrective Action Documents: CxA shall submit corrective action documents in the form of 'Issues Log'

1.14 SYSTEMS TO BE COMMISSIONED

- A. All parties associated with the design, installation and / or testing of these systems shall comply with commissioning requirements specified in this section, in the individual Division commissioning sections and in the Commissioning Plan.
- B. Equipment / Systems to be commissioned shall include:
 - a) Wet Sprinkler System (Witness Pipe Pressure Testing)
 - b) Fire Alarm and Smoke Detection (Verify Certifications)
 - c) Electric Water Heaters (4)
 - d) VFD Fan and Pump Drives
 - e) Lighting Controls
 - f) Electric Panelboards (14)
 - g) Dry Type Transformers
 - h) Finned Tube Radiation
 - i) Fan Coil Units (FCU G-1 through FCU 2-4)
 - j) Electric Unit Heater (EUH-1)
 - k) Cabinet Unit Heaters (CUH-1)
 - l) Building Automation System

1.15 COORDINATION

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- A. The Owner/CM will furnish copies of all construction documents, addenda, change orders and appropriate approved submittals and shop drawings to the CxA.
- B. The CxA shall coordinate directly with the Owner / CM on the project specific to their responsibilities and contractual obligations. If the contractor is a subcontractor to another contractor, the CxA shall disseminate written information to all responsible parties relative to the nature and extent of the communication.
- C. The CxA is primarily responsible to the Owner, and therefore shall regularly apprise the Owner of progress, pending problems and / or disputes, as well as provide regular status reports on progress with each system.
- D. The CxA shall coordinate the schedule of commissioning activities with the construction schedule. It is possible that some procedures will be completed before the entire mechanical or electrical system is completed.

1.16 SCHEDULE

- A. Commissioning of systems shall proceed per the criteria established with activities to be performed on a timely basis. The CxA shall be available with a 48 hour notice to respond promptly and avoid construction delays.
- B. Startup and testing of systems may proceed prior to final completion of systems to expedite progress. However, the CxA shall not schedule testing and checkout services that are the primary responsibility of the contractor / vendor in advance of their testing and checkout.
- C. Open issues observed shall be addressed immediately, responsible parties notified, and corrective actions coordinated in a timely manner.
- D. Construction schedules and scheduling are the responsibility of the CM. The CxA shall provide commissioning scheduling information to the Owner's Representative and CM for review and planning activities.

1.17 OTHER REQUIREMENTS

- A. Commissioning requires support from the CM, GC, Trade Contractors and subcontractors. The commissioning process does not relieve any contractors from their obligations to complete all portions of work in a satisfactory manner.
- B. Commissioning requirements in this section should not be confused with "commissioning" requirements, if appeared, at the end of various technical specification sections. Those requirements that are at the end of various technical specification sections are part of the quality control procedures and are to be completed by the respective contractor before the commissioning process begins.
- C. Refer to the Commissioning plan submitted by the CxA for a detailed description of all commissioning requirements and responsibilities for all involved parties including: Owner, Owner's Representative, Architect, Design Engineer, CM, GC, Trade Contractors, and Subcontractors.

PART 2 – PRODUCTS

2.1 TEST EQUIPMENT

- A. All industry standard test equipment required for performing the specified tests shall be provided by the appropriate party responsible for the testing. Any proprietary vendor specific test equipment shall be provided by that vendor or manufacturer.

- B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents, shall be included in the base bid price to the Trade Contractor and left on site, except for standalone data logging equipment that may be used by the CxA.
- C. Any portable or handheld setup / calibration devices required to initialize the control system shall be made available by the control vendor (at no additional cost) to the CxA.
- D. The instrumentation used in the commissioning process shall comply with the following:
 - 1. Be of sufficient quality and accuracy to test and / or measure system performance within the tolerances required.
 - 2. Be calibrated at the manufacturer's recommended intervals with calibration tags permanently affixed to the instrument.
 - 3. Be maintained in good repair and operating condition throughout use duration on this project.
 - 4. Be immediately recalibrated or repaired if dropped and / or damaged in any way during use on this project.

PART 3 – EXECUTION

3.1 COMMISSIONING PLAN AND SCHEDULE

- A. The CxA shall develop and submit a schedule identifying the commissioned system and commissioning process which is integrated by the CM with the construction schedule. The required work by all team members (CxA, Trade Contractors and the Owner) shall be included. Overlay with the construction schedule, and include time for test and balance, Installation checkouts, as well as Functional testing.
- B. Commissioning Plan: The Commissioning Plan provides guidance in the execution of the Commissioning process. Just after the initial Commissioning kickoff meeting, the CxA will update the plan, which is then considered the "final" plan (though it will be a living document that may continue to evolve and expand as the project progresses). The Specifications will take precedence over the Commissioning Plan.

3.2 COMMISSIONING PROCESS

- A. Commissioning Process: The following provides an overview of the Commissioning tasks during design and construction and the general order in which they occur.
 - 1. Design Phase
 - a. Commissioning shall include the commissioning design review (usually 100% DD, and 100% CD), to provide comments from commissioning perspective.
 - 2. Construction Phase
 - a. Commissioning during construction begins with a Commissioning orientation meeting, conducted by the CxA, where the Commissioning process is reviewed with the other Commissioning team members.
 - b. Equipment documentation for commissioned systems/equipment is submitted to the CxA for review, concurrent with normal submittals, including detailed startup procedures.
 - c. The CxA works with the CM, Trade Contractors and subcontractors in developing IC/FC documentation formats.

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- d. In general, the checkout and performance verification proceeds from simple to complex; from component level to equipment to systems and intersystem levels with Installation checklists being completed before Functional Performance Checklists.
- e. The Subs, with guidance from the CxA, execute and document the Installation checklists and perform startup and initial checkout. The CxA documents that the checklists and startup were completed according to the approved plans. This may include the CxA witnessing portions of the startup of selected equipment and spot checking the Installation check sheets.
- f. The CxA develops specific equipment and system Functional check sheets. The Subs receive copies of the procedures. The CxA may request additional design narrative from the A/E and Controls Contractor, depending on the completeness of the design intent documentation and sequences provided with the Specifications.
- g. The Functional and/or system performance check sheets are executed by the subs, witnessed by the CxA.
- h. Items of non-compliance in material, installation or setup are corrected and the system rechecked not to exceed one additional time.
- i. The CxA reviews the Operation & Maintenance documentation for completeness.
- j. Commissioning is completed before Substantial Completion.
- k. The CxA reviews the training documentation. The training schedules are provided by the Subs and CxA verifies that training was completed.

3.3 INSTALLATION / FUNCTIONAL CHECKS

- A. Personnel experienced in the technical aspects of each system to be commissioned shall develop and document the commissioning procedure to be used. Include a performance checklist and performance checkout data sheets for each system based on actual system configuration. These procedures shall be reviewed by the Owner for technical depth, clarity of documentation and completeness. Special emphasis shall be placed on checkout procedures that shall conclusively determine actual system performance and compliance with the design intent.
- B. The majority of mechanical equipment requires safety devices to stop and / or prevent equipment operation unless minimum safety standards or conditions are met. These may include adequate oil pressure, proof-of-flow, non-freezing conditions, maximum static pressure, maximum head pressure, etc. The party responsible for checkout procedures shall observe the actual performance of safety shutoffs in a real or closely simulated condition of failure.
- C. Systems may include safety devices and components that control a variety of equipment operating as a system. Interlocks may be hard-wired or operate from software. The party responsible for commissioning checkout procedures shall verify operation of these interlocks.
- D. The CxA shall determine the acceptance procedures for each system within disciplines. The acceptance procedures shall incorporate the commissioning standards and successful testing results as referred to throughout specifications.

As guidance for HVAC system acceptance, the following should be considered

1. The temperature control system shall have all I/O points individually verified for proper function, calibration, and operation. The CxA shall review proposed testing procedures and report formats, and observe sufficient field testing to confirm that all I/O points have been properly tested.
 2. All control sequence of operation strategies, alarm generation and reporting shall also be reviewed and proper operation verified by the CM and Trade Contractors with oversight by the CxA.
 3. The central work station (BMS) graphics, point assignments, alarm messages, and logging functions shall be verified.
- E. The appropriate contractor and vendor(s) shall be informed of what tests are to be performed and the expected results. Whereas some test results and interpretations may not become evident until the actual tests are performed, all parties shall have a reasonable understanding of the requirements. The commissioning plan shall address those requirements and be distributed to all parties involved with that particular system.
- F. Acceptance procedures shall confirm the performance of systems to the extent of the design intent. When a system is recommended to be accepted, the Owner shall be assured that the system is complete, works as intended, is correctly documented, and operator training has been performed.

3.4 FUNCTIONAL TESTS – OBSERVATION / WITNESS

- A. The Functional tests shall be performed by the contractors and vendors with oversight by the CxA. The CxA shall witness, verify and document these tests.
- B. Check sheets shall be completed comprehensively and to the extent necessary to enable the CxA to assure the Owner that the systems do perform per the owner's requirement.

3.5 TESTING PREPARATION

- A. Prerequisites for Testing:
 1. Certify that commissioned systems, subsystems and equipment have been completed, calibrated and started; are operating according to the OPR, BOD and Contract Documents; and that Certificates of Readiness are signed and submitted.
 2. Certify that all relevant instrumentation and control systems have been completed and calibrated; are operating according to the OPR, BOD and Contract Documents; and that pretest set points have been recorded.
 3. Certify that testing, adjusting and balancing (TAB) procedures have been completed, and that TAB report have been submitted, discrepancies corrected and corrective work approved.
 4. Test systems and intersystem performance after approval of testing check sheets for systems, subsystems and equipment.
 5. Set systems, subsystems and equipment to operating mode to be tested (e.g., normal shut down, normal auto position, normal manual position, unoccupied cycle, emergency power and alarm conditions).
 6. Verify each mode of operation once it is operating in a steady state condition.
 7. Inspect and verify the position of each device and interlock identified on checklists. Sign off each item as acceptable or failed. Repeat this test for each operating cycle that applies to system being tested.
 8. Check safety cutouts, alarms and interlocks with smoke control and life safety systems during each mode of operation when applicable.

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9. Annotate checklist or data sheet when a deficiency is observed.
10. Verify equipment interface with monitoring and control system and the TAB

3.6 TESTING

- A. Test systems and intersystem performance as per the test procedures. Perform tests using design conditions whenever possible.
 1. Simulate conditions by imposing an artificial load when it is not practical to test under design conditions and when written approval for simulated conditions is received from CxA. Before simulating conditions, calibrate testing instruments. Set and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.
 2. Alter setpoints when simulating conditions is not practical and when written approval is received from CxA.
 3. If a test is failed for reason and retesting is required, the concerned agency (contractor, equipment manufacturer) shall provide the service on an agreed upon date at no cost to the owner.
 4. Alter sensor values with a signal generator when design or simulating conditions and altering set points are not practical. Do not use sensor to act as signal generator to simulate conditions or override values.

3.7 COST OF RETESTING

- A. The cost for the GC/trade contractor to retest a prefunctional or functional test, if they are responsible for the deficiency, shall be theirs.
- B. For a deficiency identified, not related to any prefunctional checklist or start-up fault, the following shall apply: The CxA will direct the retesting of the equipment once at no charge to the owner for their time. However, the CxA's time for a second retest will be reimbursed by the contractor.
- C. The time for the CxA to direct any retesting required because a specific prefunctional checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, the cost will be reimbursed by the contractor.
- D. Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for a time extension by the prime contractor or GC.

3.8 OPERATION & MAINTENANCE MANUALS

- A. General
 1. The CxA shall review the Operation & Maintenance manuals provided by Trade Contractors or subcontractors for completeness of the document. The review process shall verify that Operation & Maintenance instructions meet specifications and are included for all commissioned equipment furnished by the Trade Contractor.
 2. Published literature shall be specifically oriented to the provided equipment, indicating required operation and maintenance procedures, parts lists, assembly / disassembly diagrams and related information.

3. The Trade Contractor shall incorporate the standard technical literature into system specific formats for this facility as designed and as actually installed. The resulting Operation & Maintenance information shall be system specific, concise, to the point and tailored specifically to this facility. The CxA shall review these documents as necessary for final corrections by the Trade Contractor.
- B. The Operation & Maintenance Manual review and coordination efforts shall be completed prior to Owner training sessions, as these documents are to be utilized in the training sessions.
 - C. System Operations Manual
 1. The CxA shall prepare and deliver these documents with inputs from other agencies. The contractors will confirm the proper documents are onsite and readily available. Typically, the manual includes the following:
 - a. Commissioned systems single line diagrams (MEP and BMS contractors).
 - b. As built sequences of operations, control drawings and original set points (AE and BMS contractor)
 - c. Operating instructions for integrated building systems (mechanical and BMS contractors).
 - d. Recommended schedule of maintenance requirements and frequency (contractors).
 - e. Recommended schedule for calibrating sensors and actuators (BMS contractor)

3.9 TRAINING

- A. The CM shall schedule and coordinate training sessions for the Owner's staff for each commissioned system. Training shall be held per Contract Documents, along with the appropriate schematics, handouts and visual / audio training aids onsite with equipment.
- B. The equipment vendors shall provide training on the specifics of each major equipment item including philosophy, troubleshooting and repair techniques.
- C. For additional prescription pertinent to training, refer to other specific divisions for training requirements.

3.10 WARRANTY REVIEW / SEASONAL TESTING

- A. The CxA will return upon the start of the new season (cooling or heating) after project completion to conduct performance tests that could not be performed due to ambient conditions. The seasonal testing will only be performed if unsuitable loads / conditions were unavailable during the performance testing stages (in other words; the requirement for testing is warranted).
- B. If agreed upon by Owner, Seasonal Testing can also be used for the Warranty Review. During which the CxA will interview the occupants, maintenance staff, review the operation of the building, provide recommendations for installation and operational problems and document warranty and operational issues in the issues database.

3.11 RECORD DRAWINGS

- A. The CxA shall review the as built contract documents to verify incorporation of both design changes and as built construction details. Discrepancies noted shall be corrected by the appropriate party.

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3.12 EXCLUSIONS

- A. Responsibility for construction means and methods: The CxA is not responsible for construction means & methods, job safety or any construction management functions on the job site.
- B. Hands on work by the CxA: The Trade Contractors shall provide all services requiring tools or the use of tools to startup, test, adjust or otherwise bring equipment and systems into a fully operational state. The CxA shall coordinate and observe these procedures (and may make minor adjustments) but shall not perform any construction, field or technician services other than verification of testing, adjusting, balancing and control functions.

***** END OF SECTION 01 91 00 *****

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide demolition in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:
1. Selective demolition and removal of selected portions of a building, to the extent indicated on the Drawings, and as required to accommodate the new construction.
 2. Protection of existing site work and portions of building adjacent to or affected by selective demolition.
 3. Vibration control and dust control noise control.
 4. Disconnection, capping, and removal abandoned utilities and wiring systems.
 5. Removal and legal disposal of materials.
 6. Temporary supports and facilities.
- B. Related Sections:
1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
 2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
 3. Division 1 Section "Construction Waste Management".
 4. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and reinstalled.
- B. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
- C. Existing to Remain: Existing items of construction that are not to be removed.

1.4 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to remain the City of New York's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.

1.5 SUBMITTALS

- A. **LEED BUILDING Submittal Requirements:** The contractor or subcontractor shall submit the following LEED BUILDING certification items:
1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
 2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.
- B. **Schedule of Selective Demolition Activities:** Indicate the following:
1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure City of New York's on-site operations are uninterrupted.
 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 3. Coordination for shutoff, capping, and continuation of utility services.
 4. Use of elevator and stairs.
 5. Locations of proposed dust- and noise-control temporary partitions and means of egress.
 6. Coordination of City of New York's continuing occupancy of portions of existing building and of City of New York's partial occupancy of completed Work.
 7. Means of protection for items to remain and items in path of waste removal from building.
- C. **Predemolition Photographs or Videotapes:** Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by selective demolition operations.
- D. Contractor shall provide shop drawings and calculations for all temporary supports, shoring and bracing required. Comply with the State of New York Building Code requirements for preparation of submittals and do all required filing. Drawings and calculations for shoring and bracing shall be signed and sealed by a New York State licensed Professional Engineer responsible for their preparation.

1.6 QUALITY ASSURANCE

- A. **Demolition Firm Qualifications:** An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. **Regulatory Requirements:** Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. **Standards:** Comply with ANSI A10.6 and NFPA 241.

- D. Predemolition Conference: Conduct conference at Project site. Review methods and procedures related to selective demolition including, but not limited to, the following:
1. Inspect and discuss condition of construction to be selectively demolished.
 2. Review structural load limitations of existing structure.
 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 5. Review areas where existing construction is to remain and requires protection.

1.7 PROJECT CONDITIONS

- A. Structures and portions of buildings to be demolished will be vacated and their use discontinued before start of Work.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by City of New York as far as practical.
- C. Notify Commissioner of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work. Where applicable, refer to "Section 028013 - Allowance for Incidental Asbestos" of these Specifications and DDC General Conditions regarding hazardous materials.
1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Commissioner and City of New York. City of New York will remove hazardous materials under a separate contract.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
1. Maintain fire-protection facilities in service during selective demolition operations.

1.8 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.

- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Commissioner.
- D. Engage a Professional Engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.
- E. Survey of Existing Conditions: Record existing conditions by use of measured drawings, preconstruction photographs or preconstruction videotapes.
 - 1. Comply with requirements specified in "DDC General Conditions."
 - 2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.
- F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES

- A. Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.
 - 1. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by City of New York and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to City of New York and to governing authorities.
 - a. Provide not less than 72 hours' notice to City of New York if shutdown of service is required during changeover.
- B. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving structures to be demolished.
 - 1. Contractor will arrange to shut off indicated utilities when approved by Commissioner.
 - 2. Where applicable, arrange to shut off indicated utilities with utility companies.
 - 3. Utility Requirements: Refer to Division 22 and 26, Sections for additional requirements.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Comply with requirements for access and protection specified in DDC's General Conditions.
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly.

B. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

- C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Commissioner, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.
- D. Refer to the Drawings for the full extent and scope of selective demolition work required for this Project.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
 - 1. Provide and maintain interior and temporary shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of portions of the masonry and adjoining structures to be selectively demolished.
 - 2. Strengthen or add new supports when required during progress of selective demolition.
 - 3. Provide temporary supports and facilities of the size, type, strength and design as recommended by a State of New York licensed Professional Engineer.
 - 4. Cease operations and notify the City of New York immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operation.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be recycled, or otherwise indicated to remain City of New York's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off City of New York's property and legally dispose of them.

3.7 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 028013 – GENERAL CONTRACTOR WORK
ALLOWANCE FOR INCIDENTAL ASBESTOS ABATEMENT

1.01 SCOPE FOR ASBESTOS ABATEMENT WORK

- A. The "General Conditions" apply to the work of this Section.
- B. The Asbestos abatement contractor shall remove asbestos containing materials as needed to perform the other work of this Contract when discovered during the course of work. When required, the Asbestos abatement contractor shall replace the ACM with non-asbestos containing materials. An allowance of **\$15,000.00** for the **General Contractor** is herein established for this incidental work when so ordered and authorized by the Commissioner.
- C. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE APPLICABLE PROVISIONS OF THE RULES AND REGULATIONS OF THE ASBESTOS CONTROL PROGRAM AS PROMULGATED BY TITLE 15 CHAPTER I OF RCNY AND NEW YORK STATE DEPARTMENT OF LABOR INDUSTRIAL CODE RULE 56 CITED AS 12 NYCRR, PART 56 WHICHEVER IS MORE STRINGENT AS PER LATEST AMENDMENTS TO THESE LAWS AND AS MODIFIED HEREIN BY THESE SPECIFICATIONS.
- D. ALL DISPOSAL OF ASBESTOS CONTAMINATED MATERIAL SHALL BE PER LOCAL LAW 70/85.
- E. THE ASBESTOS ABATEMENT CONTRACTOR'S ATTENTION IS DIRECTED TO THE FACT THAT CERTAIN METHODS OF ASBESTOS ABATEMENT ARE PROTECTED BY PATENTS. TO DATE, PATENTS HAVE BEEN ISSUED WITH RESPECT TO "NEGATIVE PRESSURE ENCLOSURE" OR "NEGATIVE-AIR" OR "REDUCED PRESSURE" AND "GLOVE BAG".
- F. THE ASBESTOS ABATEMENT CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR AND SHALL HOLD THE DEPARTMENT OF DESIGN AND CONSTRUCTION AND THE CITY HARMLESS FROM ANY AND ALL DAMAGES, LOSSES AND EXPENSES RESULTING FROM ANY INFRINGEMENT BY THE ASBESTOS ABATEMENT CONTRACTOR OF ANY PATENT, INCLUDING BUT NOT LIMITED TO THE PATENTS DESCRIBED ABOVE, USED BY THE ASBESTOS ABATEMENT CONTRACTOR DURING PERFORMANCE OF THIS AGREEMENT.
- G. "Asbestos" shall mean any hydrated mineral silicate separable into commercially usable fibers, including but not limited to chrysotile (serpentine), amosite (cumingtonite-grunerite), crocidolite (riebeckite), tremolite, anthrophyllite and actinolite.

- H. Prior to starting, the Asbestos abatement contractor must notify the Commissioner of the Department of Design and Construction if he/she anticipates any difficulty in performing the Work as required by these Specifications. The Asbestos abatement contractor is responsible to prepare and submit all filings, notifications, etc. required by all City, State and Federal regulatory agencies having jurisdiction.

The Asbestos abatement contractor is responsible for submitting the Asbestos Project Notification Form (ACP-7 Form) to the Department of Environmental Protection, Asbestos Control Program, as per Title 15, Chapter I of RCNY and to the NYSDOL as per Industrial Code Rule 56.

The Asbestos abatement contractor is responsible for preparing, and submitting Asbestos Variance Application (ACP-9). If a Variance is required, the Asbestos abatement contractor is responsible to retain a NYSDOL Asbestos Project Designer, as defined in Title 15, Chapter 1 of the RCNY to prepare and submit the required variance.

The Asbestos abatement contractor is responsible for preparing and submitting an Asbestos Abatement Permit and/or Work Place Safety Plans (WPSP) that may be required for the completion of the Contract or incidental work. If such plans are required, the Asbestos abatement contractor is responsible to retain a NYSDOL Licensed Design Professional as defined in Title 15, Chapter 1 of the RCNY to prepare and submit the required plans.

The Asbestos abatement contractor is responsible for the submission of all required documents to the NYCDEP to acquire the appropriate Asbestos Project Conditional Closeout (ACP-20) and/or Asbestos Project Completion Forms (ACP-21) on a timely basis for the completion of the incidental work encountered under this contract.

The Asbestos abatement contractor will be required to attend an on-site job meeting with the Construction Project Manager prior to the start of work to examine conditions and plan the sequence of operations, etc.

The Asbestos abatement contractor shall have a NYSDOL/NYCDEP Asbestos Supervisor onsite to oversee the work and conduct a final visual inspection as required by both Title 15, Chapter 1 of the RCNY and NYSDOL Industrial Code Rule 56.

- I. All work shall be done during regular working hours unless the Asbestos abatement contractor requests authorization to work in other than regular working hours and such authorization is granted by the Commissioner. (Regular work hours are those hours during which any given facility, in which work is to be done, is customarily open and functioning, normally between the hours of 8:00 A.M. and 4:00 P.M. Monday - Friday.) If such work schedule is authorized by the Commissioner, the work shall be done at no additional cost to the City.

- J. The Commissioner may order that work be done in other than regular working hours as herein by defined and this order may require the Asbestos abatement contractor to pay premium or overtime wages to complete the work. If the Commissioner orders work in other than regular working hours, the Asbestos abatement contractor shall multiply the unit price for that portion of the work requiring premium wages by 1.50 when computing payment in accordance with Paragraph 1.09. All requests for premium payment must be supported by certified payroll sheets and field sheets approved by the Construction Project Manager.

1.02 QUALIFICATIONS OF ASBESTOS ABATEMENT CONTRACTOR

- A. Requirements: The asbestos abatement contractor must demonstrate compliance with the special experience requirements set forth in subparagraphs (1) through (5) below. The asbestos abatement contractor must, submit documentation demonstrating compliance with all listed requirements. Such documentation shall include without limitation, all required licenses, certificates, and documentation.
1. The asbestos abatement contractor must, whether an individual, corporation, partnership, joint venture or other legal entity, must demonstrate for the three year period prior to the work, that it has been licensed by the New York State Department of Labor, as an "Asbestos abatement contractor".
 2. The asbestos abatement contractor must, for the three year period prior to the work, have been in the business of providing asbestos abatement services as a routine part of its daily operations.
 3. The asbestos abatement contractor proposing to do asbestos abatement work must be thoroughly experienced in such work and must provide evidence of having successfully performed and completed in a timely fashion at least five (5) asbestos abatement projects of similar size and complexity. The aggregate cost of these projects must be at least \$250,000.00 in each of the three years.
 4. For each project submitted to meet the experience requirements set forth above, the asbestos abatement contractor must submit the following information for the project; name and location of the project; name title and telephone number of the owner or the owner's representative who is familiar with the asbestos abatement contractor's work, brief description of the work completed as a prime or sub-asbestos abatement contractor; amount of contract or subcontract and the date of completion.
 5. The asbestos abatement contractor must demonstrate that it has the financial resources, supervisory personnel and equipment necessary to carry out the work and to comply with the required performance schedule, taking into consideration other business commitments. The asbestos

abatement contractor must submit such documentation as may be required by the Department of Design and Construction to demonstrate that it has the requisite capacity to perform the required services of this contract.

- B. Insurance Requirements: The asbestos abatement contractor must provide asbestos liability insurance in the following amount: 1 million dollars per occurrence, 2 million dollars aggregate (combined single limit). The City of New York shall be named as an additional insured on such insurance policy.
- C. Throughout the specifications, reference is made to codes and standards which establish qualities and types of workmanship and materials, and which establish methods for testing and reporting on the pertinent characteristics thereof.

1.03 ASBESTOS ABATEMENT CONTRACTOR RESPONSIBILITIES

The Asbestos abatement contractor will visit the subject location within one (1) working day of notification to ascertain actual work required. If the project is identified as being "urgent", then work shall commence no later than 48 hours from the time of notification. In this event, the asbestos abatement contractor shall immediately notify when applicable EPA NESHAPS Coordinator, NYSDOL Asbestos Control Bureau and NYCDEP Asbestos Control Program of start of the work and file the necessary Asbestos Notifications and any applicable Variance Applications with the regulatory agencies cited above..

In the event that the project is not classified as "urgent" the Asbestos abatement contractor shall notify the EPA NESHAPS Coordinator, NYSDOL and NYCDEP by submitting the requisite asbestos project notification forms, postmarked 10 days before activity begins if 260 linear feet or more and/or 160 square feet or more of asbestos containing material will be disturbed.

The following information must be included in the notification:

- A. Name and address of building City or operator;
- B. Project description:
 - 1. Size - square feet, number of linear feet, etc;
 - 2. Age - date of construction and renovations (if known);
 - 3. Use - i.e., office, school, industrial, etc.
 - 4. Scope - repair, demolition, cleaning, etc.
- C. Amount of asbestos involved in work and an explanation of techniques used to determine the amount;

- D. Building location/address, including Block and Lot numbers;
- E. Work schedule including the starting and completion dates;
- F. Abatement methods to be employed;
- G. Procedures for removal of asbestos-containing material;
- H. Name, title and authority of governmental representative sponsoring project.

1.04 WORK INCLUDED IN UNIT PRICE

The Asbestos abatement contractor will be paid a basic unit price of **\$25.00** per square feet for the removal and disposal of asbestos containing material and replacement of the same with non-asbestos containing materials.

Unit price shall include all costs necessary to do the work of this Contract, including but not limited to: labor, materials, equipment, utilities, disposal, insurance, overhead and profit.

1.05 AIR MONITORING – ASBESTOS ABATEMENT CONTRACTOR

- A. "Air Sampling" shall mean the process of measuring the fiber content of a known volume of air collected during a specific period of time. The procedure utilized for asbestos follows the NIOSH Standard Analytical Method 7400 or the provisional transmission electron microscopy methods developed by the USEPA and/or National Institute of Standard and Technology which are utilized for lower detectability and specific fiber identification.
- B. Air monitoring of Asbestos abatement contractor's personnel will be performed in conformance with OSHA requirements, (All costs associated with this work are deemed included in the unit price.).
- C. Qualifications of Testing Laboratory:

The industrial hygiene laboratory shall be a current proficient participant in the American Industrial Hygiene Association (AIHA) PAT Program. The laboratory identification number shall be submitted and approved by the City. The laboratory shall be accredited by the AIHA and New York State Department of Health Environmental Laboratory Approval Program (ELAP).

Note: Work area air testing and analysis before, during and upon completion of work (clearance testing) will be performed by a Third Party Air Monitor under separate Contract with the City.

1.06 THIRD PARTY MONITORING AND LABORATORY

- A. The NYCDDC, at its own expense, will employ the services of an independent Third Party Air Monitoring Firm and Laboratory. The Third Party Air Monitor will perform air sampling activities and project monitoring at the Work Site.
- B. The Laboratory will perform analysis of air samples utilizing Phase Contrast Microscopy (PCM) and/or Transmission Electron Microscopy (TEM).
- C. The Third Party Air Monitoring Firm and the designated Project Monitor shall have access to all areas of the asbestos removal project at all times and shall continuously inspect and monitor the performance of the Asbestos abatement contractor to verify that said performance complies with this Specification. The Third-Party Air Monitor shall be on site throughout the entire abatement operation.
- D. The NYCDDC will be responsible for costs incurred with the Third Party Air Monitoring Firm and laboratory work. Any subsequent additional testing required due to limits exceeded during initial testing shall be paid for by the Asbestos abatement contractor.

1.07 PAYMENT REQUEST DOCUMENTATION

- B. The following information shall be included for each payment request:
 - 1. Description of work performed.
 - 2. Linear footage and pipe sizes involved.
 - 3. Square footage for boiler & breaching insulation removed.
 - 4. Square footage of non pipe and boiler areas removed, patched, enclosed, sealed, or painted.
 - 5. Square footage of encapsulation, sealing, patching, and painting involved.
 - 6. Total cost associated with compliance with the assigned task.
 - 7. Architectural, Electrical, HVAC, Plumbing, etc. work incidental to the Asbestos Abatement Work.
 - 8. A certified copy (in form 4312-39) to the Comptroller or Financial Officer of the New York City to the effect that the financial statement is true.
 - 9. A signed copy (in form 6506q-6) of certificate of compliance with non-discriminatory provisions of the Contract.

10. Attach a copy of valid workmen compensation insurance.
 11. Valid asbestos insurance per occurrence.
 12. General liability insurance when required.
- C. Each payment request shall include a grand total for all work completed that billing period, the landfill waste manifests and a copy of waste transporter permit. The Department of Design and Construction will inspect the work performed, review the cost and approve or disapprove requests for payment.
- D. EXPOSURE LOG: With this final payment, the Asbestos abatement contractor shall submit a listing of the names and social security numbers of all employees actively engaged in the abatement work of this Contract. This list shall include a summary showing each part of the abatement work in which the employee was engaged and the dates thereof.

1.08 QUANTITY CALCULATIONS

In order to determine the square footage involved for the various pipe sizes of pipe insulation that might be encountered, the following table is to be used.

<u>PIPE INSULATION SIZE O.D.</u>	<u>PIPE SIZE O.D.</u>	<u>SQUARE FOOTAGE PER LINEAR FOOT</u>
2-1/2"	1/2"	0.65
2-3/4"	3/4"	0.72
3"	1"	0.79
3-1/4"	1-1/4"	0.85
3-1/2"	1-1/2"	0.92
4"	2"	1.05
4-1/2"	2-1/2"	1.18
5"	3"	1.31
6"	3-1/4"	1.57
7"	3-1/2"	1.83
8"	4"	2.09
9"	5"	2.36
10"	6"	2.62
12"	8"	3.14
14"	10"	3.67
16"	12"	4.19
18"	14"	4.71

1.09 METHOD OF PAYMENT

Payment shall be made in accordance with Items A through R below. Payment shall be calculated based on the actual quantity of the item performed by the asbestos abatement

contractor, times the unit price specified below. Credits may apply to certain times, as specified below.

- A. **REMOVAL, DISPOSAL AND REPLACEMENT OF ASBESTOS CONTAINING PIPE INSULATION:** Actual linear footage, multiplied by the square footage factor listed for the respective pipe size in Section 1.09, multiplied by the unit price in Section 1.05.

EXAMPLE: 100 lin.ft. of 1/2" pipe and 100 lin.ft. of 6" pipe, including elbows, tees. Flanges, etc.

$$100 \times 0.65 = 65 \text{ sq.ft.} \quad 65 \times \text{unit price} = \text{Payment}$$

$$100 \times 2.62 = 262 \text{ sq.ft.} \quad 262 \times \text{unit price} = \text{Payment}$$

- B. **REMOVAL, DISPOSAL AND REPLACEMENT OF BOILER INSULATION:** (all types including Silicate Block and including the removal/replacement of metal jacketing) Payment shall be made at 1.5 times the unit price per square foot.

EXAMPLE: Item B. removal and replacement of 1000 S.F. of boiler insulation (incl. Silicate block)

$$1000 \text{ S.F.} \times (1.5) \times \text{the Unit Price} = \text{Payment}$$

- C. **REMOVAL, DISPOSAL AND REPLACEMENT OF TANK INSULATION:** (all types including removal/replacement of metal jacketing) Payment shall be made at 1.5 times the unit price per square foot.
- D. **REMOVAL, DISPOSAL AND REPLACEMENT OF BOILER UPTAKE, & BREACHING INSULATION:** (all types including stiffening angles and wire lath) Payment shall be made at 2.0 times the unit price per square foot.
- E. **REMOVAL, DISPOSAL AND REPLACEMENT OF DUCT INSULATION:** Payment shall be made at 1.0 times the unit price per square foot.
- F. **REMOVAL, DISPOSAL AND REPLACEMENT OF SOFT ASBESTOS CONTAINING MATERIAL:** (Including sprayed-on fire proofing and sound proofing) Payment shall be made at 1.0 times the unit price per square foot of surface area. Area of irregular surfaces must be calculated and confirmed with DDC representative.
- G. **ACOUSTIC PLASTER REPAIR AND/OR ENCAPSULATION:** Payment shall be made at 0.5 times the unit price per square foot.
- H. **PATCHING OR REPAIR** of items listed in A through F will be paid at 0.33 times the unit price per square foot.

- I. **REMOVAL, DISPOSAL AND REPLACEMENT OF WATERPROOFING ASBESTOS CONTAINING MATERIAL:** (including friable and non-friable waterproofing material from interior and exterior walls, floors, foundations, penetrations, louvers, vents and openings other than windows, doors and skylights) Payment shall be made at 0.5 times the unit price per square foot.
- J. **REMOVAL, DISPOSAL AND REPLACEMENT OF ASBESTOS CONTAINING ELECTRICAL WIRING INSULATION:** (including friable and non-friable wiring insulation) Payment shall be made at 0.33 times the unit price per square foot.
- K. **PAINTING:** Payment shall be made at 0.05 times the unit price per square foot.
- L. **REMOVAL AND DISPOSAL OF ASBESTOS-CONTAINING PLASTER:** from ceilings and walls, including any wire lath and disposal as asbestos containing waste. Payment shall be made at 0.80 times the unit price per square foot.
- M. **REMOVAL AND DISPOSAL OF ASBESTOS-CONTAINING FLOOR TILES, CEILING TILES, TRANSITE PANELS:** (including any adhesive, glue, mastic and/or underlayment) and disposal as asbestos containing waste. Payment shall be made at 0.40 times the unit price per square foot. If multiple layers are discovered, each additional layer shall be paid at 0.20 times the unit price per square foot.
- N. **ADDITIONAL CLEAN UP/HOUSEKEEPING OF WORK AREA:** (excluding pre-cleaning of work area required by regulations) HEPA vacuuming and wet cleaning of asbestos contaminated surface. Payment shall be made at 0.20 times the unit price per square foot. When GLOVE BAG is employed to remove ACM, cost of HEPA vacuuming and wet cleaning of floor area up to 3 feet on each side of glove-bag shall be included in unit price and no extra payment will be made.
- O. **REMOVAL, DISPOSAL OF ASBESTOS-CONTAINING ROOFING MATERIAL:** including mastic, flashing and sealant compound and provide temporary asbestos-free roof covering consisting of one layer of rolled roofing paper sealed with asphaltic roofing compound. Payment shall be made at 0.8 times the unit price per square foot. Credit at a rate of 0.33 times the unit price will be taken for each square foot of temporary roof covering which the Asbestos abatement contractor is directed not to install.
- P. **PICK-UP AND DISPOSAL OF GROSS DEBRIS:** (excluding any waste generated from abatement under Item A-R) at a rate of \$150 per cubic yard for asbestos contaminated waste and \$75 per cubic yard for non-asbestos contaminated waste. This cost includes all labor and material cost associated with work.

- Q. **REMOVAL OF ASBESTOS-CONTAINING BRICK, BLOCK, MORTAR, CEMENT OR CONCRETE:** along with all surfacing materials including wire lath and/or other supporting structures and disposal as ACM waste. Payment shall be made at a rate of \$25.00 per cubic foot of material removed.
- R. **REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING WINDOW/DOOR CAULKING:** including friable and non-friable caulking, weather-stripping, glazing, sealants or other waterproofing materials applied to windows, doors, skylights, etc. Payment shall be made at the rate of \$400.00 per opening regardless of size or configuration. This cost includes labor, consumable materials, set-up/breakdown, removal and disposal, as required.

Note 1: CREDIT: For items listed in A through F, a credit at a rate of 0.33 times the unit price, times the respective multiplier (for each item) will be taken for each square foot of insulation which the asbestos abatement contractor is not directed to reapply.

Note 2: MINIMUM PAYMENT: The minimum payment per call at any individual job sites or various job sites during the same day will be eight hundred dollars (\$800.00).

Note 3: All payments shall be made as described in paragraph 1.09 herein.

Note 4: WORKING HIGHER THAN 12 FEET ABOVE FLOOR LEVEL OR WORK REQUIRING COMPLEX SCAFFOLDING OR CONSTRUCTION WORK PLATFORMS: Provisions are made in this Contract to compensate the Asbestos abatement contractor for work performed in locations that are difficult to access due to work at elevations that are significantly higher than the normal work level. The unit price for these items will be paid at 1.20 times the unit price described in Paragraphs 1.09, A through R for those portions of the work that are more than twelve (12) feet above the grade for that would be judged as the normal working level.

1.10 GUARANTEE

- A. Work performed in compliance with each task shall be guaranteed for a period of one year from the date the completed work is accepted by the Department of Design and Construction.
- B. The Commissioner of The Department of Design and Construction will notify the Asbestos abatement contractor in writing regarding defects in work under the guarantee.

1.11 OCCUPANCY OF SITE NOT EXCLUSIVE

Attention is specifically drawn to the fact that contractors, performing the work of other Contracts, may be brought upon any of the work sites of this Contract. Therefore, the Asbestos abatement contractor shall not have exclusive rights to any site of his work and shall fully cooperate and coordinate his work with the work of other contractors who may

be brought upon any site of the work of this Contract. This paragraph applies to those areas outside the regulated Work Area as defined by Title 15, Chapter I of RCNY.

1.12 SUBMITTALS

A. Pre-Construction Submittals:

1. Attend a pre-construction meeting scheduled by the City of New York Department of Design and Construction. This meeting shall also be attended by a designated representative of the City of New York third party air monitoring firm, facility manager and the Construction Project Manager. At this meeting, the Asbestos abatement contractor shall present three copies of the following items:
 - a. Asbestos abatement contractor's scope of work, work plan and schedule.
 - b. Asbestos project notifications, approved variances and plans to Government Agencies.
 - c. Copies of Permits, clearance and licenses if required.
 - d. Schedules: the Asbestos abatement contractor shall provide to the Construction Project Manager a copy of the following schedules for approval. Once approved, schedules shall be maintained and updated as received. Asbestos abatement contractor shall post a copy of all schedules at the site:
 - (1) A construction schedule stating critical dates of the project including, but not limited to, mobilization, Work Area preparation, demolition, gross removal, fine cleaning, encapsulation, inspections, clearance monitoring, and phase of refinishing and final inspections. The schedule shall be updated biweekly, at a minimum.
 - (2) A schedule of staffing stating number of workers per shift per activity, name and number of supervisor(s) per shift, shifts per day, and total days to be worked.
 - (3) Submit all changes in schedule or staffing to the Construction Project Manager prior to implementation.
 - e. Written description of emergency procedures to be followed in case of injury or fire. This section must include evacuation procedures, source of medical assistance (name and telephone number to nearest

hospital) and procedures to be used for access by medical personnel (examples: first aid squad and physician). NOTE: Necessary Emergency Procedures Shall Take Priority Over All Other Requirements of These Specifications.

- f. Material Safety Data Sheets (MSDS) for encapsulants, sealants, firestopping foam, cleaners/disinfectants, spray adhesive and any and all potentially hazardous materials that may be employed on the project. No work involving the aforementioned will be allowed to proceed until MSDS are reviewed.
- g. Worker Training and Medical Surveillance: The Asbestos abatement contractor shall submit a list of the persons who will be employed by him /her to perform the removal work. Present evidence that workers have received proper training required by the regulations and the medical examinations required by OSHA 29 CFR 1926.1101.
- h. Logs: Specimen copies of daily progress log, visitor's log, and disposal log.
 - (1) The Asbestos abatement contractor shall provide a permanently bound log book of minimum 8-1/2" x 11" size at the entrance to the Worker and Waste Decontamination enclosure system as hereinafter specified. Log book shall contain on title page the project name, name, address and phone number of the Asbestos abatement contractor; name, address and phone number of Asbestos abatement contractor and City's third party air monitoring firm; emergency numbers including, but not limited to local Fire/Rescue Department. Log book shall contain a list of personnel approved for entry into the Work Area.
 - (2) All entries into the log shall be made in non-washable, permanent ink and such pen shall be strung to or otherwise attached to the log to prevent removal from the log-in area. Under no circumstances shall pencil entries be permitted. Any significant events occurring during the abatement project shall be entered into the log. Upon completion of the job, the Asbestos abatement contractor shall submit the logbook containing a day-to-day record of personnel log entries countersigned by the Construction Project Manager every day.
- i. Worker's Acknowledgments: Submit statements signed by each employee that the employee has received training in the proper handling of ACM, understands the health implications and risks

involved; and understands the use and limitations of the respiratory equipment to be used.

B. During Construction Submittals:

1. Security and safety logs showing names of person entering workspace, date and time of entry and exit, record of any accident, emergency evacuation, and any other safety and/or health incident.
2. Progress logs showing the number of workers, supervisors, hours of work and tasks completed shall be submitted daily to the Construction Project Manager.
3. Floor plans indicating Asbestos abatement contractor's current work progress shall be submitted for review by the Construction Project Manager.
4. All Asbestos abatement contractors' air monitoring and inspection results.

C. Project Closeout Submittals:

Upon completion of the project and as a condition of acceptance, the Asbestos abatement contractor shall present two copies of the following items, bound and indexed:

1. Lien Waivers from Asbestos abatement contractor, Sub-Asbestos abatement contractors and Suppliers,
2. Daily OSHA air monitoring results,
3. All Waste Manifests (Asbestos and Construction Debris), seals and disposal logs,
4. Field Sign-In/Sign-Out Logs for every shift,
5. Copies of all Building Department Forms and Permits,
6. A Letter of Compliance stating that all the work on this project was performed in accordance with the Specifications and all applicable Federal, State and Local regulations,
7. All Warranties as stated in the Specifications,
 - a. Fully executed disposal certificates and transportation manifest.
8. Project Record: The Asbestos abatement contractor shall maintain a project record for all small and large asbestos projects. During the project, the

project record shall be kept on site at all times. Upon completion of the project, the project record shall be maintained by the building owner. The project record shall be submitted to DDC as part of the close out documents. The project record shall consist of:

- a. Copies of licenses of all asbestos abatement contractors involved in the project;
- b. Copies of NYCDEP and NYSDOL supervisor and handler certificates for all workers engaged in the project;
- c. Copies of all project notifications and reports filed with NYCDEP, NYSDOL and USEPA for the project, with any amendments or variances;
- d. Copies of all asbestos abatement permits, including associated approved plans and work place safety plan;
- e. A copy of the air sampling log and all air sampling results;
- f. A copy of the abatement asbestos abatement contractor's daily log book;
- g. Copies of all asbestos waste manifests;
- h. A copy of all Project Monitor's Reports (ACP-15).
- i. A copy of each ATR-1 Form completed for the asbestos project (if required).
- j. A copy of each Asbestos Project Conditional Closeout Report (ACP-20) if required.
- k. A copy of the Asbestos Project Completion Form (ACP-21).

1.13 PROTECTION OF FURNITURE AND EQUIPMENT

Cover all furniture and equipment that cannot be removed from Work Areas. Movable furniture and equipment will be removed from Work Areas by the Asbestos abatement contractor prior to start of work. At the conclusion of the work (after final air testing), the Asbestos abatement contractor will remove all plastic covering on walls, floors, furniture, equipment and reinstall furniture and equipment. He shall remove and store all sheaths, curtains and drapes, and reinstall same following final clean up.

1.14 UTILITIES

A. General:

All temporary facilities shall be subject to the approval of the Commissioner. Prior to starting work at any site, locations and/or sketches (if required) of temporary facilities must be submitted to the Construction Project Manager for the required approval.

B. Water:

The Department of Design and Construction will furnish all water needed for construction, at no cost to the Asbestos abatement contractor in buildings under their jurisdiction. However, it is the responsibility of the Asbestos abatement contractor to ensure that hot water is provided for showering in the decontamination unit. The Asbestos abatement contractor shall furnish, install and maintain any needed equipment to meet these requirements at his own expense.

C. Electricity:

The Department of Design and Construction will furnish all electricity needed for construction, at no cost to the Asbestos abatement contractor in a building, under their jurisdiction. The Asbestos abatement contractor is responsible for routing the electric power to the abatement Work Area.

All temporary lighting and temporary electrical service for Work Area shall be in weatherproof enclosures and be ground fault protected.

- D.** In leased spaces, arrangements for water supplies and electricity must be made with the landlord. However, all such arrangements must be made through and are subject to approval of the Department of Design and Construction. Utilities will be provided at no cost to the Asbestos abatement contractor. However, it is the Asbestos abatement contractor's (or the General contractor's) responsibility to furnish and install a suitable distribution system to the Work Area. This system will be provided at no cost to the City.

1.15 FEES

The Asbestos abatement contractor shall be responsible for any and all fees or charges imposed by Local, State or Federal Law, Rule and Regulation applicable to the work specified herein, including fees or charges which may be imposed subsequent to the date of the Bid opening.

END OF SECTION

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SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Suspended slabs.
 - 2. Concrete toppings.
 - 3. Post-Installed anchors
- B. Related Sections:
 - 1. Section 033300 "Architectural Concrete" for general building applications of specially finished formed concrete.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 ACTION SUBMITTALS

- A. General:
 - 1. Review of submittals is of a general nature only, and responsibility for conformance with the intent of the Contract Documents shall remain with the Contractor.
 - 2. All submissions shall be in accordance with the submission schedule developed and agreed between the Commissioner and Contractor at the commencement of the project. Submission shall include dates of order and delivery of materials to the shop and the site.
 - 3. Shop drawing schedule shall allow adequate time for reviews. Submittal shall include all related pieces in an assembly or area. The Contractor shall allow adequate time in the shop drawing preparation stage for the dimensioning process and coordination with the Architectural Drawings and those of other disciplines. Reinforcing steel shall not be fabricated or placed before the shop drawings have been reviewed by the Commissioner and returned.
- B. Product Data: For each type of product indicated.
- C. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

2. Product Data for Credit IEQ 4.3: For liquid floor treatments and curing and sealing compounds, documentation including printed statement of VOC content.
 3. Design Mixtures for Credit ID 1.1: For each concrete mixture containing fly ash as a replacement for portland cement or other portland cement replacements, and for equivalent concrete mixtures that do not contain portland cement replacements.
- D. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
1. For each concrete mixture, the following information shall be included: where the mix is to be used, all materials and admixtures including their source and proportions in the mix; Water content, water-to-cement ratio, slump, and aggregate grading; whether the mixture is appropriate for pumping; and total chloride content.
 2. Provide shrinkage test results for mixes with shrinkage criteria showing that mix meets performance criteria. The mix design number must match with the mix design number shown on the test data.
 3. Indicate compressive strength and method used to determine strength. The compressive strength of the concrete shall be proportioned per ACI. Include all calculations and tests required by ACI 318 Section 5.3 and 5.4. Laboratory test data must be submitted along calculations that show with each mix design meets the strength requirement. Mix design number must match the mix design number shown on the test data. Include all test results or past history back up data specific as part of the submittal. Test results within the past two years shall be used to indicate performance in accordance with past history.
 4. Indicate amounts of mixing water to be withheld for later addition at Project site.
 5. Each mix shall be stamped and signed by a Professional Engineer licensed in the State of New York.
- E. Steel Reinforcement Shop Drawings: Placing drawings in accordance with SP 66 that detail fabrication, bending, and placement. Direct copies of the contract documents are not acceptable as a submission from the Contractor.
1. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
 2. Shop drawings shall make it clear where each bar is located. Beams, grade beams and walls shall be shown in elevation. On elevations show locations of sleeves and penetrations.
 3. Check architectural, structural, mechanical, and electrical and other contract documents for anchor bolt schedules and locations, anchors, inserts, conduits, sleeves, and any other items which are required to be cast in concrete, and make necessary provisions as required so that reinforcing steel will not interfere with the placement of such embedded items.
 4. Show all areas of congestion. Identify where reinforcing steel will interfere with the placement of embedded items such as anchor bolts, anchors, inserts, conduits, sleeves and any other items which are required to be cast in concrete.
- F. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.
1. Design Criteria:
 - a. Design of concrete formwork, shoring, reshoring and bracing shall be the sole responsibility of the Contractor and shall conform to Code requirements and shall be in accordance with the recommendations of ACI 347. Forms shall provide the required shape and dimensions specified on the Documents.
 - b. Provide forms complete and of such strength and adequately braced so as to prevent any spreading, shifting or settling when concrete is placed to ensure finished concrete surfaces of the required tolerances.

- c. Forms shall be tight to prevent leakage or washing out of cement mortar from concrete.
 - d. Bolts, rods, and other devices when used for internal ties and spreaders shall be of such construction that when the forms are removed, no metal shall be within 1 inch of the exterior concrete surfaces or within 1/2 inch of interior concrete surfaces.
2. Shop Drawing Requirements:
- a. Shop Drawings shall show location and layout of construction joints, reveals, slab edges, form joints, sleeves, openings, locations of tie holes or plugs, location of embedded items and blockouts, and all related details affecting Architectural quality.
 - b. Shop Drawings will show dimensioned location to the face of formwork for walls, beams, columns, slab edges, slab depressions, etc.
 - c. Formwork details affecting Architectural finish quality shall be reviewed by the Commissioner.
 - d. Indicate where formwork release agent will be used, as applicable.
 - e. Where a mock-up is required, submit shop drawings of the mock-up.
- G. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing reshoring. Show how forces will be transferred to the reshores. Show that procedures will not cause damage to the structure nor result in additional permanent deflections. Provide calculations by a Professional Engineer licensed in the State of New York.
- H. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
1. Location of construction joints is subject to approval of the Commissioner.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Testing Agency.
- B. Material Certificates: For each of the following, signed by manufacturers:
1. Cementitious materials, per ASTM C150.
 2. Admixtures. Where more than one admixture is used, include certification that admixtures are compatible. Per ASTM C494 for each type used; include chloride ion content.
 3. Form materials and form-release agents.
 4. Steel reinforcement and accessories.
 5. Curing compounds.
 6. Floor and slab treatments.
 7. Bonding agents.
 8. Adhesives.
 9. Semirigid joint filler.
 10. Joint-filler strips.
 11. Post-installed concrete anchors.
 12. Repair materials.
- C. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
1. Lightweight aggregate, per ASTM C330.
- D. Mill Test Reports: Submit steel producer's certificates of mill analysis for each heat or melt of reinforcing steel, including steel source, description, heat number, yield point, ultimate tensile

strength, elongation percent, bend test and the chemical composition of each heat as determined by ladle analysis, before delivery of steel to site.

- E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- F. Transit-Mix Delivery Slips
 1. Keep record at the Site showing time and place of each pour of concrete, together with transit mix delivery slip certifying contents of the pour per ASTM C94. Include the time water was added to dry mix.
 2. Make the record available for inspection at the Site and to the Commissioner for his review upon request.
 3. Upon completion of this portion of the Work, deliver the record and the delivery slips to the Commissioner.
- G. Field quality-control test and inspection reports.
- H. As-Built Drawings: If required by the City of New York, at the end of the work included in this Section, submit a complete set of reproducible drawings incorporating all changes, additions, and deletions to the Construction Drawings due to revisions, change orders, field conditions, or any other reason.

1.6 QUALITY ASSURANCE

- A. Comply with the following unless modified by requirements in the Contract Documents:
 1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5 and Section 7, "Lightweight Concrete."
 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
 3. ACI 318, "Building Code Requirements for Reinforced Concrete."
 4. ACI SP-66, "Detailing Manual"
 5. New York City Building Code.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Qualifications: City of New York shall be qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- E. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures. When mixes, are proportioned by trial batch

method, engage a Laboratory conforming to ASTM E329 and under direction of a Professional Engineer licensed in New York State.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement:

1. Deliver, store, and handle steel reinforcement to prevent bending and damage.
2. Deliver reinforcing to Site properly bundled and tagged. Use tags that indicate bar size, lengths and marks corresponding to markings shown on shop drawings. Segregate so as to maintain identification after bundles are broken.
3. Store reinforcement in a manner that will prevent excessive rusting or fouling with/ grease, oil, dirt, and other bond weakening materials.
4. Do not use damaged, reworked, or deteriorated material.

B. Formwork: Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use.

C. Concrete Materials:

1. Protect cement from moisture and rotate stock to ensure fresh materials.
2. Protect aggregates as necessary to maintain saturated condition when batched.
3. Storage methods should comply with ACI 301 4.1.4.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.

2.2 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 60 percent.
- B. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- C. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I or II, gray. Supplement with the following:
 - 2. Supplement Portland Cement with the following Supplementary Cementitious Materials (SCM):
 - a. Fly Ash: ASTM C 618, Class F.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
 - c. The SCM producer shall have a minimum of 5 years experience in the production of acceptable SCM and shall practice an effective quality control program to guard against contamination of the SCM.
 - d. Cementitious material used shall have at least 2 years of use with proposed aggregates without detrimental reaction.
 - e. Alkali content shall not exceed 0.6% when tested in accordance with ASTM C114.
 - f. The temperature of cement delivered to the plant shall not exceed 150 degrees F.
- B. Lightweight Aggregate: ASTM C 330, 1/2-inch or 3/8-inch nominal maximum aggregate size. Provide aggregates from a single source with documented service record of at least 2 years satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
 - 1. Lightweight cellular and granular inorganic materials, free from oil, organic matter, or other deleterious substances.
 - 2. Uniformly graded from 1/4-inch to maximum size. The combined grading shall be such that the percentage of weight of the combined aggregates shall fall within the limits established by ASTM C330.
 - 3. Dry weight of lightweight concrete shall not be greater than 120 pcf.
 - 4. Lightweight Aggregates Rotary Kiln Produced: Expanded shale slate, clay or slag aggregate, the maximum size used in a particular location shall be consistent with the form and dimensions of the section being placed, with the location and spacing of the reinforcing steel and with the method of vibration. The aggregate sizes shall be such as will produce dense, uniform concrete, free of honeycombs, or other irregularities.

- C. Water: ASTM C 94 and potable.

2.5 ADMIXTURES

- A. General: Only if accepted by the City of New York's Representative in accordance with ACI 318/318R 3.6 if they comply with requirements of ASTM C494. Where more than one is used, admixtures shall be compatible. Use of admixtures shall be consistent throughout Work.
1. Where specified herein do not use other admixtures without the written acceptance of the Commissioner.
 2. Prohibited Admixtures: Admixtures containing more than 0.05 percent chloride ions, fluorides, sulphites, thiocyanates, and/or nitrates are not permitted. Do not use admixtures that will negatively impact the visual finish of concrete exposed to view.
- B. Air-Entraining Admixture: ASTM C 260.
- C. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.6 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
1. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
1. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- F. Curing Compound (Strippable): The compound shall conform to ASTM C309. For use on slabs receiving subsequent applied finishes and where noted on the drawings. Install in strict accordance with the manufacturer's recommendation and supervision..

2.7 RELATED MATERIALS

- A. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- B. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types I and II, non-load bearing, IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- C. Reglets: Fabricate reglets of not less than 0.022-inch-thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- D. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.
- E. Post-Installed Concrete Anchors:
 - 1. Expansion Anchors: Kwik Bolt III or TZ by Hilti Inc, or approved equal. Provide diameter and embedment depth as noted on drawings.
 - 2. Epoxy Dowels / Epoxy Anchors: HIT HY 150 MAX by Hilti, Inc., or approved equal. Provide diameter and embedment depth as noted on drawings.

2.8 REPAIR MATERIALS

- A. High Strength Flowing Repair Mortar: For forming and pouring structural members, or large horizontal repairs, provide the flowable one-part, high strength microsilica modified repair mortar with 3/8" aggregate. The product shall achieve 9000 psi @ 28-days at a 9-inch slump.
- B. Concrete Patching Mortar:
 - 1. Horizontal repairs, ASTM C1059, Type II.
 - 2. Vertical or Overhead repairs, ASTM C1059, Type II.
- C. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.
 - 5. Bond Strength: Not less than 1000 psi at 28 days when tested according to ASTM C1042.
- D. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.
5. Product shall exhibit the following properties: Chaplin Abrasion Test – 0.0079-inches maximum at 28 days.

2.9 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 1. Contractor shall be responsible for the design of the concrete mixes and assume full responsibility for the strength, consistency, water cementitious material ratio and handling of concrete.
 2. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
 3. Form TR3: Technical Report Concrete Design Mix: The contractor shall be responsible for, and bear all costs associated with the filing and securing of approvals, if any, for Form TR-3: Technical Report Concrete Design Mix, including but not limited to, engaging the services of a New York City licensed Concrete Testing Lab for the review and approval of concrete design mix, testing, signatures, and professional seals, etc., compliant with the NYC Department of Buildings requirements, for each concrete design mix.
- B. Cementitious Materials:
- C. Use fly ash and ground granulated blast-furnace slag as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent, without exceeding the following limits:
 1. Fly Ash: 60 percent.
 2. Ground Granulated Blast-Furnace Slag: 60 percent.
 3. Combined Fly Ash and Ground Granulated Blast-Furnace Slag: 60 percent with fly ash not exceeding 25 percent.
- D. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.
- E. Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

2.10 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Definition of Mix Properties:
 1. Concrete strength (f_c) is the minimum compressive strength at 28 days, tested in accordance with ASTM C39.
 2. Aggregate size is the largest of the coarse aggregate.

3. Slump shall be measured at the point of delivery in accordance with ASTM C143 prior to the addition of superplasticizer (if used). Slump tolerance shall meet the requirements of ACI 117. Slump can be increased with use of a superplasticizer to improve workability of mix. After addition of superplasticizer, slump shall not exceed 8" at point of delivery.
 4. Air content is by volume and may be plus or minus 1.5 percent at point of delivery.
 5. Water/cement ratio is specified by weight.
 6. Drying shrinkage limit is percentage change in length after 21 days of drying when tested as per ASTM C157 with 4 inches x 4 inches x 11 inches specimen moist cured 7 days prior to drying.
- B. Suspended Slabs, Slab on Metal Deck and Housekeeping Pads: Proportion structural lightweight concrete mixture as follows:
1. Minimum Compressive Strength: 4000 psi at 28 days.
 2. Maximum Water-Cementitious Materials Ratio: 0.55.
 3. Calculated Equilibrium Unit Weight: 110lb/cu. ft. plus or minus 3 lb/cu. ft. as determined by ASTM C 567.
 4. Slump Limit: 4 inches, plus or minus 1 inch.
 5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.11 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."
- B. Bending:
1. Minimum bend diameters and hook extensions as shown on the Contract Drawings.
 2. Reinforcing bars are to be bent cold unless heating is permitted.
 3. Do not bend or kink reinforcing except as shown on the Contract Drawings.
 4. Do not bend or straighten reinforcing bars in a manner that will injure the material.
 5. Do not rebend reinforcement that has previously been bent within 6 inches of new bend except as allowed in section 3.3.2.8 of ACI 301

2.12 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prior to Work specified in this Section, carefully inspect the installed Work of other trades and verify that such Work is complete to the point where this installation may properly commence.
- B. Verify that forms may be constructed in accordance with all applicable codes and regulations, the referenced standards, and the design documents.
 - 1. Verify reinforcing steel has been inspected prior to concealing with formwork.
- C. The Contractor shall verify all dimensions prior to starting construction.
- D. Coordinate:
 - 1. Obtain necessary information for coordination of formwork with items to be embedded in concrete.
 - 2. Coordinate size and location of openings in concrete. Obtain Commissioner's approval for openings not shown on Structural Drawings.
- E. Discrepancies:
 - 1. Notify the Commissioner of any discrepancies or inconsistencies.
 - 2. Do not proceed with installation in areas of discrepancy until such discrepancies have been fully resolved.

3.2 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117. Make proper provision for all openings, offsets, recesses, anchorage, blocking, and other features of the Work as shown or required. Provide openings as required for vibrators and concrete placing.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch for smooth-formed finished surfaces.
 - 2. Class B, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement. Do not allow excess form coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed.

3.3 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. Install dovetail anchor slots in concrete structures as indicated.
- B. Provide pipe sleeves when pipes pass through concrete. Fill voids in sleeves, inserts and anchor slots with readily removable material to prevent entry of concrete into voids.
- C. No conduit shall be cast in concrete unless approved by Commissioner.
- D. Coring of concrete after placement is not permitted without prior approval by Commissioner.

3.4 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Commissioner.
- D. Re-use of forms shall in no way delay or change the schedule for placement of concrete from the schedule obtained if all of the forms were new.

3.5 SHORES AND RESHORES

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
 - 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.6 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Wherever embedded items interfere with placing of reinforcement notify the Commissioner and obtain approval before placing any concrete. Do not bend or field cut bars around openings or sleeves.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
 - 1. Do not exceed the tolerances specified in ACI 117.
 - 2. Welding of reinforcement bars is not permitted.
 - 3. Reinforcement shall be held in place by means of supports adequate to prevent displacement and to maintain reinforcement at proper distance from form face. The use of wood supports and spacers inside the forms is not permitted.
 - 4. Dowels shall be tied securely in place before concrete is deposited. In the event there are no bars in position to which dowel may be tied, No 3 bars (minimum) shall be added to provide proper support and anchorage.
 - 5. Do not place reinforcement in floor slabs or beams until concrete has been placed in columns and walls, except where bars extend down into columns or walls.
 - 6. Use templates for placement of column dowels.
 - 7. Where Drawings do not show the spacing of the reinforcing, the minimum clear spacing shall conform to ACI 318 Section 7.6.
 - 8. Reinforcing partially embedded in concrete shall not be field bent except as shown on the Drawings or accepted by the Commissioner.
 - 9. Wherever conduits, piping, inserts, sleeves, etc., interfere with placing of reinforcing steel, obtain acceptance of method of procedure before any concrete is placed. Bending or cutting of bars around openings or sleeves not permitted.

- D. Splicing: Make splices only at those locations shown on the Drawings or as accepted by the Commissioner. Splice locations not shown on the Drawings shall be approved in shop drawings before fabrication. Stagger splices in adjacent bars wherever possible.
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- F. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Commissioner.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 - 6. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

3.8 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. The addition of water at the site is contingent upon full time inspection of the process by the City of New York's testing laboratory and the acceptance of the Inspector. Comply with ACI 301, section 4.3.2.1.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- C. Method: Convey concrete as rapidly and directly as practicable to preserve quality and to prevent segregation.
 - 1. Do not deposit concrete that has initially set. Retempering of concrete, which has partially set, is not permitted.
 - 2. Maximum time for discharge of concrete shall be per ASTM C94.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of

weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.
 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Fill Over Steel Deck:
1. At floor slabs, increase fill thickness as required to compensate for deflection of beams and deck at no additional cost to City of New York. Obtain specified fill thickness at high points of the deck. Finish floor to specified tolerances for floor flatness and levelness, including at suspended fill on steel deck floors
- G. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When concrete is expected to be placed at air temperatures of less than 40 deg F, contractor shall review with Commissioner all special procedures that will be used including mix design modifications and methods of protection. This review shall occur prior to the expected extreme temperatures.
 2. Provide sufficient protection material and equipment on the Project site in advance of the time when the mean daily temperatures are expected to drop below 40 degrees F.
 3. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301. In addition, take precautions including, but not limited to:
 - a. Use non-chloride, non-corrosive accelerating admixture in accordance with previously accepted submittals.
 - b. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - c. Do not use calcium chloride, salt, or other materials containing antifreeze agents unless otherwise specified and approved in mixture designs.
- H. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. When concrete is expected to be placed at air temperatures of greater than 80 deg F, contractor shall review with Commissioner all special procedures that will be used including mix design modifications and methods of protection. This review shall occur prior to the expected extreme temperatures.

2. Provide sufficient protection material and equipment on the Project site in advance of the time when the mean daily temperatures are expected to rise above 80 degrees F.
3. When air temperature exceeds 80 deg F, take special precautions to prevent slump loss, rapid setting, and plastic shrinkage; including but not limited to:
 - a. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - b. Use set retarding admixture in accordance with previously accepted submittals.
 - c. Convey, deposit, finish and commence curing of concrete as rapidly as practicable.
4. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
- C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
 2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
 3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
1. Apply scratch finish to surfaces to receive concrete floor toppings and receive mortar setting beds for bonding cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
1. Apply float finish to surfaces to receive trowel finish and to be covered with sand-bed terrazzo.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient floor, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-filmed-finish coating system.
 2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces. While concrete is still plastic, slightly scarify surface with a fine broom.
1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.12 POST-INSTALLED CONCRETE ANCHORS

- A. Installation of Epoxy Grouted Anchors
1. Holes to receive epoxy grouted reinforcing steel or threaded holes shall be drilled 1/4-inch larger than the embedded item.
 2. Install the grout according to the manufacturer's recommendations with due care given to cleaning hole prior to injection of grout.
 3. Use care to insure that reinforcing steel or threaded rods to be embedded in epoxy grout are clean of oil and other substances that impact the bond to the grout.
 4. Remove excess grout on the surface of the existing concrete. Use sandblasting or other mechanical means.
 5. Use washers on all bolts.

6. Use care when drilling holes so as not to damage existing reinforcing steel. Contractor to locate existing reinforcing steel using non-destructive testing.
- 7.

B. Installation of Cementitious Grouted Anchors

1. Holes to receive cementitious grouted reinforcing steel or threaded rods shall be drilled with an annular space of 1/2-inch, i.e. hole diameter shall be 1 inch larger than the maximum diameter (e.g. out-to-out of bar deformations) of the embedded item.
2. Install the grout according to the manufacturer's recommendations with due care given to cleaning hole of all grease, oil, dirt and loose particles prior to placement of grout.
3. Saturate surface 24 hours just prior to grouting. Remove all free water prior to grouting. The surface shall be saturated surface dry at the time of grouting.
4. Install grout and anchors with due care to ensure continuous bonding between surfaces and that there are no voids in the grout.
5. Use care to ensure that reinforcing steel or threaded rods to be embedded in grout are clean of oil and other substances that impact the bond to the grout.
6. Remove excess grout on the surface of the existing concrete. Use sandblasting or other mechanical means.
7. Use care when drilling holes so as not to damage existing reinforcing steel. Contractor to locate existing reinforcing steel using non-destructive testing.

3.13 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.

- b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.
 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.14 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 2. Do not apply to concrete that is less than required by manufacturer's written instructions.
 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
- B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.15 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.16 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Commissioner. Remove and replace concrete that cannot be repaired and patched to Commissioner's approval.
- B. Defective Concrete is defined as concrete which is under strength, out of line, level or plumb, or shows objectionable cracks, honeycombing, rock pockets voids, spalling, exposed

reinforcement, that has any sawdust, wood, or debris embedded in it, or is otherwise defective, and in the Commissioner's judgment these defects impair the proper strength or appearance of the work. Any concrete work not in accordance with the Specification and Drawings will be deemed to be defective.

- C. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- D. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Commissioner.
- E. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and

loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

- F. Perform structural repairs of concrete, subject to Commissioner's approval, using epoxy adhesive and patching mortar.
- G. Repair materials and installation not specified above may be used, subject to Commissioner's approval.

3.17 FIELD QUALITY CONTROL

- A. Testing and Inspecting: City of New York to perform special inspections, and prepare test reports.
- B. Inspections: As a minimum the inspector will make all tests and inspections as required by the Special Inspection provisions of the New York City Building Code. City of New York will make all the tests and inspections indicated in the Contract Documents.
 - 1. Steel reinforcement placement.
 - 2. Headed bolts and studs.
 - 3. Verification of use of required design mixture.
 - 4. Concrete placement, including conveying and depositing.
 - 5. Curing procedures and maintenance of curing temperature.
 - 6. Verification of concrete strength before removal of shores and forms from beams and slabs.
 - 7. Post-installed concrete anchors, per ICC-ES recommendations.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - 1. Testing Frequency: Samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, nor less than once for each 50 cubic yards of concrete nor less than once for each 5,000 square feet of surface area for slabs or walls.
 - a. If the total volume of concrete is such that the frequency of testing would provide less than five strength tests for a given class of concrete, tests shall be made from at least five randomly selected batches or from each batch if fewer than five batches are used.
 - 2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 - 3. Air Content: ASTM C 173/C 173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 - 5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - 6. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - 7. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

- a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 9. Test results shall be reported in writing to Commissioner, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Commissioner but will not be used as sole basis for approval or rejection of concrete.
 11. Additional Tests: City of New York shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Commissioner. City of New York may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Commissioner.
 - a. If test results indicate that compressive strength requirements have not been met, the Contractor shall justify that the load carrying capacity of the structure has not been reduced. Carry out tests of cores drilled from the area in question as directed by the Commissioner in accordance with ASTM C43 and ACI 318 Section 5.6.5.
 - b. If the compressive tests of the core specimens fail to show the compressive strength specified, the concrete shall be deemed defective and shall be replaced or adequately strengthened in a manner acceptable to the Commissioner. Perform load tests as outlined in ASTM C39, as directed by the Commissioner, on the questionable portion of the Work.
 12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- D. Reinforcing Steel
1. Notify the City of New York and the Commissioner at least 48 hours before concrete is to be poured or reinforcing is covered up.
 2. Before any concrete is poured on any particular portion of the building, the reinforcing steel and form dimensions will be inspected by the City of New York. Any errors or discrepancies shall be corrected before concrete is placed.
 3. As a minimum, all testing and inspection as per the requirements of the New York City Building Code. Reinforcing steel to be assumed to have been designed for calculated stresses in excess of 70 percent of the basic allowable values.
 4. In addition to other required inspections, the following are subject to Special Inspection as per IBC Chapter 1704.4:
 - a. Placement of Reinforcing Steel
 5. A special inspector from the City of New York shall be present during all field bending of reinforcement.
 6. Installation of deformed bar anchors to be tested in accordance with Section 7.1 of AWS D1.1.
 7. Comply with ICC-ES approvals with respect to special inspection required during installation.
 8. Testing and inspection of mechanical splices and reinforcing couplers to conform to manufacturer's recommendations and ICC-ES approval.

- E. Measure floor and slab flatness and levelness according to ASTM E 1155 within 48 hours of finishing.

3.18 PROTECTION OF LIQUID FLOOR TREATMENTS

- A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 033000

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SECTION 035416 – HYDRAULIC CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide cement underlayment in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Hydraulic-cement-based, polymer-modified, self-leveling underlayment for application below interior floor coverings.

B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction Waste Requirements".
4. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:
1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
 2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.

- B. Product Data: For each type of product indicated, submit manufacturer's technical literature, performance criteria and installation instructions.
- C. Shop Drawings: Include plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions.
- D. Product Certificates: Signed by manufacturers of underlayment and floor-covering systems certifying that products are compatible.
- E. Qualification Data: Submit written information that demonstrates capabilities and experience of qualified installer.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Installer who is authorized by manufacturer for application of underlayment products required for this Project.
- B. Product Compatibility: Manufacturers of underlayment and floor-covering systems certify in writing that products are compatible.
- C. Fire-Resistance Ratings: Where indicated, provide hydraulic-cement underlayment systems identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
- D. Sound Transmission Characteristics: Where indicated, provide hydraulic-cement underlayment systems identical to those of assemblies tested for STC and IIC ratings per ASTM E 90 and ASTM E 492 by a qualified testing agency.
- E. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage, mixing with other components, and application.
- B. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.
 - 1. Place hydraulic-cement-based underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F.

1.7 COORDINATION

- A. Coordinate application of underlayment with requirements of floor-covering products and adhesives, specified in Division 9 Sections, to ensure compatibility of products.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance, provide self-leveling underlayment as manufactured by one of the following, or approved equal:
1. Ardex.
 2. Euclid Chemical Company (The).
 3. L&M Construction Chemicals, Inc.
 4. Maxxon Corporation.
 5. Approved equal.

2.2 HYDRAULIC-CEMENT-BASED UNDERLAYMENTS

- A. Underlayment: Hydraulic-cement-based, polymer-modified, self-leveling product that can be applied in minimum uniform thickness of 1/4 inch and that can be feathered at edges to match adjacent floor elevations.
1. Basis of Design: Subject to compliance, provide SD-T as manufactured by Ardex, or approved equal.
 - a. Cement Binder: ASTM C 150, portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C 219.
 - b. Compressive Strength: Not less than 6100 psi at 28 days when tested according to ASTM C 109.
 - c. Color: As indicated on the Drawings and Material Schedule, or as selected by the Commissioner.
 - B. Additive: Resilient-emulsion product of underlayment manufacturer, formulated for use with underlayment when applied to substrate and conditions indicated.
 - C. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch; or coarse sand as recommended by underlayment manufacturer.
 1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.
 - D. Water: Potable and at a temperature of not more than 70 deg F.
 - E. Primer: Two part 100% solids epoxy based primer, as recommended by underlayment manufacturer.
 1. Basis of Design: Subject to compliance, provide EP 2000 as manufactured by Ardex, or approved equal.
 - F. Wear surface: Completed topping surface shall be coated with a resin-based wear protection system, as recommended by the manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for conditions affecting performance.

1. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Prepare and clean substrate according to manufacturer's written instructions.
1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
 2. Fill substrate voids to prevent underlayment from leaking.
- B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.
1. Moisture Testing: Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft in 24 hours.
- C. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

3.3 APPLICATION

- A. General: Mix and apply underlayment components according to manufacturer's written instructions.
1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
 2. Coordinate application of components to provide optimum underlayment-to-substrate and intercoat adhesion.
 3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.
- B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- C. Apply underlayment to produce uniform, level surface.
1. Apply a final layer without aggregate to product surface.
 2. Feather edges to match adjacent floor elevations.
- D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.
- E. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.
- F. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.
- G. Seal/Wear Coat: Installing floor underlayment seal as indicated by the manufacturer.

3.4 PROTECTION

- A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION 035416

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SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide masonry in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Interior concrete masonry units (CMUs), new.
2. Exterior concrete masonry patching and infill.
3. Mortar and grout.
4. Reinforcing steel.
5. Masonry joint reinforcement.
6. Ties and anchors.
7. Miscellaneous masonry accessories.

- B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 PERFORMANCE REQUIREMENTS

- A. Performance Requirements: Provide unit masonry patching that develops installed compressive strengths (f_m) to equal to existing construction, unless greater performance is indicated or required.

1.4 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:
1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
 2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.

3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.
- B. Product Data: Submit manufacturer's product data for each type of masonry unit, accessory, and other manufactured products, including certifications that each type complies with specified requirements.
- C. Shop Drawings: Submit shop drawings for masonry, lintels and all accessories. Show sizes and shapes of units, supporting, anchoring restraint and reinforcing. In addition, provide shop drawings of each masonry unit size, shape and profile proposed in the final unit of work.
1. Shop drawings shall include a schedule of each masonry type, size, color and finish anticipated for each different building.
 2. Shop drawings shall clearly indicate the patch and repair work required. Re-built masonry assemblies shall be re-constructed to the sizes, dimensions and other characteristics indicated on the Drawings.
- D. Samples:
1. Submit samples of each type of exposed masonry unit. Include in each set of samples the full range of exposed textures to be expected in completed work.
 2. Submit 12" long samples of each type of joint reinforcement and samples of each type of anchor and tie.
 3. Submit 12" long samples of each color of each mortar type. Submit samples so they can be interleaved with masonry units.
- E. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:
1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
 2. Cementitious materials. Include brand, type, and name of manufacturer.
 3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 4. Grout mixes. Include description of type and proportions of ingredients.
 5. Reinforcing bars.
 6. Joint reinforcement.
 7. Anchors, ties, and metal accessories.
- F. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports, per ASTM C 780, for mortar mixes required to comply with property specification.
2. Include test reports, per ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

1.5 QUALITY ASSURANCE

- A. Unit Masonry Standard: Comply with ACI 530.1/ASCE 6 "Specifications for Masonry Structures."
- B. Preconstruction Testing Service: City of New York will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
1. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
 2. Mortar Test (Property Specification): For each mix required, according to ASTM C 109 for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content].
 3. Mortar Test (Property Specification): For each mix required, according to ASTM C 780 for compressive strength.
 4. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.
- C. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.
- D. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.
- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:
1. Locate mock-ups on site in locations indicated or as directed by the Commissioner.
 2. Build mock-ups for the following types of masonry in sizes of approximately 4 feet long by 4 feet high by full thickness, including face and backup wythes as well as accessories.
 - a. Each type of exposed unit masonry construction.
 3. Notify Commissioner one week in advance of the dates and times when mock-ups will be erected.
 4. Protect mock-ups from the elements with weather-resistant membrane.
 5. Retain and maintain mock-ups during construction in undisturbed condition as standard for judging completed unit masonry construction.
 6. Remove Mockup from site when directed by the Commissioner.
- F. Pre-installation Conference: Before beginning the unit masonry installation, conduct a pre-installation conference at the project site with the Contractor, manufacturer, installer, and other interested parties to review procedures, schedules, and coordination of the installation with other elements of the work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
 - 2. Where 1 wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.2 MASONRY MATERIALS FOR PATCHING AND REPAIRS

- A. General: Except as otherwise indicated, or as directed by the Commissioner, use materials for cutting and patching that are identical to existing materials. Use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials for cutting and patching that will result in equal-or-better performance characteristics.
- B. Concrete Masonry: Provide units complying with characteristics matching the existing, in-place masonry for size, weight, fire resistance rating, grade, type, and finish.
 - 1. Referenced Standards: ASTM C, Type I, and as follows:
 - 2. Unit Compressive Strength: Provide units with minimum average net area compressive strength of 1900 psi, unless otherwise indicated.

2.3 CONCRETE MASONRY UNITS (CMUs)

- A. Shapes: Provide shapes indicated and as follows:
 - 1. Provide special shapes for movement joints, headers, bonding, and other special conditions.
 - 2. Provide square-edged units for outside corners, unless otherwise indicated.
- B. Concrete Masonry Units: ASTM C 90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi unless otherwise indicated.
 - 2. Weight Classification: Normal weight.
 - 3. Sizes: As indicated on the Drawings.

2.4 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207, Type S.

- D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.
- E. Colored Cement Product: Packaged blend made from portland cement and lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.
 - 1. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
 - 2. Pigments shall not exceed 10 percent of portland cement by weight.
- F. Aggregate for Mortar: ASTM C 144.
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
- G. Aggregate for Grout: ASTM C 404.
- H. Water: Potable.

2.5 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615 or ASTM A 996, Grade 60.
- B. Masonry Joint Reinforcement, General: ASTM A 951.
 - 1. Walls: Hot-dip galvanized, carbon steel.
 - 2. Wire Size for Side Rods: W1.7 or 0.148-inch diameter.
 - 3. Wire Size for Veneer Ties: W1.7 or 0.148-inch diameter.
 - 4. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
 - 5. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
- C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.
- D. Masonry Joint Reinforcement for Multiwythe Masonry (where applicable):
 - 1. Ladder type with 1 side rod at each face shell of hollow masonry units more than 4 inches in width, plus 1 side rod at each wythe of masonry 4 inches or less in width.

2.6 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with eight subparagraphs below, unless otherwise indicated.
 - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.
 - 2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153.
- B. Corrugated Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from steel sheet, galvanized after fabrication not less than 0.067 inch thick.

- C. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.
- D. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.
 - 1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units or hollow units laid with cells horizontal.
 - 2. Where wythes do not align, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
 - 3. Wire: Fabricate from 1/4-inch- diameter, hot-dip galvanized steel wire.

2.7 MISCELLANEOUS ANCHORS

- A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.
- B. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.034-inch, galvanized steel sheet.
- C. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM A 307, Grade A ; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of dimensions indicated.
- D. Postinstalled Anchors: Provide chemical or torque-controlled expansion anchors, with capability to sustain, without failure, a load equal to six times the load imposed when installed in solid or grouted unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
 - 1. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

- A. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication. Provide units with either two loops or four loops as needed for number of bars indicated.

2.9 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.10 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Limit cementitious materials in mortar to portland cement and lime.

- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
 - 1. For reinforced masonry, use Type S.
 - 2. For interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
- D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
 - 1. Pigments shall not exceed 10 percent of portland cement by weight.
 - 2. Mix to match Commissioner's sample.
- E. Grout for Unit Masonry: Comply with ASTM C 476.
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 - 2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build walls and other masonry construction to full thickness shown. Build singlewythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
 - 1. Mix units from several pallets or cubes as they are placed.
- F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- G. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:
 - 1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 - 2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
 - 3. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 - 4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
 - 5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
 - 6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.
 - 7. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.3 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Lay brick masonry in standard running bond. Interlock each course of each wythe at corners. Do not use units with less than nominal 4" width at corners or jambs. Refer to the Drawings for details.
 - 1. Masonry Patching: Matching the existing, as indicated on the Drawings. Tooth end block units into the existing construction to continue bond pattern; where selective demolition work required saw cutting of masonry units.
 - 2. Where existing unit masonry construction is indicated to be infilled, patched and otherwise modified all exposed mortar joints and bond patterns shall match the existing.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

- D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.
- H. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

- A. Lay hollow concrete masonry units as follows:
 - 1. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

3.5 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches o.c.
 - 2. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.
 - a. Reinforcement above is in addition to continuous reinforcement.
- B. Provide continuity at corners by using prefabricated L-shaped units.
- C. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets and other special conditions.

3.6 LINTELS

- A. Install steel lintels where indicated.
- B. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.7 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 2. Limit height of vertical grout pours to not more than 60 inches.

3.8 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace existing masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean existing and new exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 3. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 4. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
 5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.9 MASONRY WASTE DISPOSAL

- A. Excess Masonry Waste: Remove excess clean masonry waste, including excess or soil-contaminated sand, waste mortar, broken masonry units, and other masonry waste, and legally dispose of off City of New York's property.

END OF SECTION 042000

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Structural steel.
2. Grout.
3. Slide bearings.

B. Related Sections:

1. Section 033000 "Cast-in-Place Concrete" for post-installed concrete anchors.
2. Section 053100 "Steel Decking" for field installation of shear connectors through deck.
3. Section 055000 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame, miscellaneous steel fabrications, and other metal items not defined as structural steel.
4. Section 055100 "Metal Stairs."

1.3 REFERENCES

- A. Follow the guidelines contained in the latest editions of the following codes, specifications and standards except where more stringent requirements are shown or specified in the Contract Documents.
1. The New York City Building Code.
 2. American Institute of Steel Construction (AISC).
 3. "Specification for Structural Steel Buildings", March 9th, 2005.
 4. AISC "Code of Standard Practice for Steel Buildings and Bridges", March 18, 2005. When reference (directly or indirectly) is made to this document, reference is made only to technical issues and excludes all issues related to schedule, City of New York's responsibilities, approvals and commercial terms.
 5. Research Council on Structural Connections (RCSC).
 6. RCSC "Specification for Structural Joints Using ASTM A 325 or A490 Bolts".
 7. American Society for Testing and Materials (ASTM)
 8. ASTM A6 "Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use".
 9. ASTM A36 "Specification for Carbon Structural Steel".
 10. ASTM A307 "Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength".
 11. ASTM A325 "Specification for Structural Bolts, Steel, heat Treated, 120/105 ksi Minimum Tensile Strength".
 12. ASTM A449 "Specification for Quenched and Tempered Steel Bolts and Studs".
 13. ASTM A490 "Specification for Heat-Treated, Steel Structural Bolts, 150 ksi Minimum Tensile Strength".

14. ASTM A500 "Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes".
15. ASTM A514 "Specification for High-Yield Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding".
16. ASTM A563 "Specification for Carbon and Alloy Steel Nuts".
17. ASTM A572 "Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel".
18. ASTM A618 "Specification for Hot-Formed and Seamless High-Strength Low-Alloy Structural Tubing".
19. ASTM A913 "Standard Specification for high-Strength Low-Alloy Steel Shapes of Structural Quality, Produced by Quenching and Self-Tempering Process (QST)".
20. ASTM A992 "Standard Specification for Steel for Structural Shapes for Use in Building framing".
21. ASTM F436 "Specification for Hardened Steel Washers".
22. ASTM F959 "Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners".
23. ASTM F1544 "Standard Specification for Anchor Bolts, Steel, 36, 55 and 106-ksi Yield Strength".
24. American Welding Society (AWS).
25. AWS D1.1 "Structural Welding Code - Steel".
26. Structural Steel Painting Council (SSPC).
27. SSPC "Steel Structures Painting Manual, Volume 2, Systems and Specifications".

1.4 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.5 PERFORMANCE REQUIREMENTS

- A. Connections: The contractor is responsible for the design of connections when they are not fully defined on the contract documents. Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated.
1. Select and complete connections using schematic details indicated on drawings and AISC 360-05.
 2. Use LRFD; data are given at factored-load level.
 3. Qualifications: Design of structural steel connections shall be under the direct supervision of a Professional Engineer experienced in the design of such components and registered in the State of New York, and shall conform to the applicable national, state and local standards.

1.6 SUBMITTALS

- A. General:
1. Review of submittals is of a general nature only, and responsibility for conformance with the intent of the Contract Documents shall remain with the Contractor.
 2. All submissions shall be in accordance with the submission schedule developed and agreed between the Commissioner and Contractor at the commencement of the project. Submission shall include dates of order and delivery of materials to the shop and the site.

3. Shop drawing schedule shall allow adequate time for reviews. Submittal shall include all related pieces in an assembly or area. The Contractor shall allow adequate time in the shop drawing preparation stage for the dimensioning process and coordination with the Architectural Drawings and those of other disciplines. Submit a schedule for steel shop and erection drawings.
- B. Product Data: For each type of product indicated.
- C. Dimensions:
1. While the position of most steel members is directly defined on the Structural Drawings, there are instances where reference shall be made to Architectural or other Drawings to deduce a dimension. The Contractor shall be responsible for such dimensional coordination and cross-referencing.
 2. With the position of steel members thus fixed, the Contractor will still need to deduce and compute other dimensions that are derivative from the basic dimensions. These may include, but are not limited to, true distance between work points, and the lengths and orientation of members. Such derivation of dimensions is the responsibility of the Contractor.
 3. To ensure accuracy of these dimensions, the Contractor shall produce layout drawings as well as detailed Shop Drawings. Although they will not be checked, these layout drawings are to be submitted at the same time as the relevant shop drawings.
- D. LEED Submittals:
1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- E. Shop Drawings: Show fabrication of structural-steel components, including details of layout and connections, fabrication of all members, and element and erection plans, and erection sequence of modules and lateral force resisting system. Direct copies of the Contract Documents are not acceptable as a submission from the Contractor. Review of Shop Drawings is of a general nature only. Responsibility for conformance with the intent of the Construction Documents shall remain with the Contractor. Review does not imply or state that the fabricator has correctly interpreted the Contract Documents.
1. Submit shop drawings to Commissioner for review and obtain Commissioner's acceptance prior to the start of fabrication. When shop drawings are resubmitted, the Contractor shall cloud and identify all changes made due to additions, deletions, and corrections to the shop drawing. Shop drawings will be returned as "Not Reviewed" if changes are not properly identified.
 2. Only shop drawings marked "No Exceptions Taken", "Revise as Noted" or "See Comments Noted" may be used by the Contractor in the work. Shop drawings marked "Rejected" or "Resubmit for Review" shall be corrected and completed as required and resubmitted to the Commissioner before they are used in the work.
 3. Include layout, member size, materials used, and beam marks.
 4. Include setting elevation for column bases..
 5. Include details of cuts, connections, splices, camber, holes, openings, doubler plates, stiffeners, and other pertinent data, including bolt hole sizes, connection materials, and welded joint designations.
 6. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 7. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
 8. Indicate surface preparation and finishes.

9. Where items such as anchor bolts and inserts are scheduled to be set into concrete or masonry provide setting drawings, templates, instructions and directions for their installation. Coordinate delivery with other work to avoid delay of job progress.
- F. Connection Design: For structural-steel connections indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
1. At the commencement of the project submit a letter signed and sealed by the Engineer that will supervise the steel connection design attesting to this responsibility. The Engineer shall be licensed in the state of New York.
 2. Submit calculations of all connections. Calculations and details shall be clearly keyed to the appropriate members on the construction documents. Calculations shall bear the seal of the Engineer supervising design of the steel connections.
 3. Connection designs for appropriate members shall be submitted simultaneously or in advance of shop drawings. Shop drawings will be returned as "Not Approved" if connection calculations are not yet submitted.
 4. When connection calculations are resubmitted, the Contractor shall cloud and identify all changes made due to additions, deletions, and corrections to the calculation. Calculations will be returned as "Not Reviewed" if changes are not identified.
 5. At the end of the steel shop drawing submission phase submit a letter, signed and sealed by the Engineer supervising the steel connection design, attesting to the completion of the work.
 6. Contractor shall not proceed with steel erection until these requirements are fulfilled.
- G. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1, "Structural Welding Code - Steel," for each welded joint qualified by testing, including the following:
1. Power source (constant current or constant voltage).
 2. Electrode manufacturer and trade name, for demand critical welds.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Professional Engineer and Testing Agency.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural steel, including chemical and physical properties.
- E. Product Test Reports: For the following:
 1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 2. Direct-tension indicators.
 3. Tension-control, high-strength bolt-nut-washer assemblies.
 4. Shear stud connectors.
 5. Shop primers.
 6. Nonshrink grout.
 7. Slide bearings.
- F. Source quality-control reports.
- G. Field quality-control reports.

- H. As-Built Drawings: If required by the City of New York, at the end of the work included in this Section, submit a complete set of reproducible drawings incorporating all changes, additions, and deletions to the Construction Drawings due to revisions, change orders, field conditions, or any other reason.

1.8 QUALITY ASSURANCE

- A. Testing Agency: Special inspection of steelwork specified in this document or requested by the City of New York will be performed by the City of New York.
1. The City of New York shall be furnished with the following:
 - a. One complete set of fabrication and erection drawings.
 - b. Material bills, cutting lists, order sheets, and mill test reports.
 - c. Information regarding time, place of rolling, and shipment of materials to shop.
 - d. If requested, representative sample pieces for testing.
 - e. Full and ample means and assistance for testing materials.
 - f. Access and facilities, including scaffolding, temporary work platforms, etc., for testing and inspection at all places where materials or components are stored, fabricated or erected in the mill, shop or field.
 - g. Complete set of welding procedures.
 - h. Welder qualifications.
 - i. Reports for all Contractor tests and inspections.
 2. In addition to the work specified elsewhere in the Contract Documents, the City of New York shall review the following for compliance with the project specifications:
 - a. Fastener Installation Procedures.
 - b. WPSs and WPQRs.
 - c. Manufacturer's Test Reports and Certifications.
- B. Comply with applicable provisions of the current edition of the following specifications and documents, except where more stringent requirements are shown or specified.
1. AISC 303 "Code of Standard Practice for Structural Steel Buildings and Bridges".
 2. AISC 360, "Specification for Structural Steel Buildings".
 3. AISC "Steel Construction Manual".
 4. RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts." with supplements.
 5. American Welding Society (AWS) D1.1
 6. New York City Building Code.
- C. Fabricator Qualifications: The fabricator shall have a minimum of 3 years experience in similar types of fabrication. Fabricator shall be able to furnish evidence of ability, facilities, and proficiency of personnel.
- D. Installer Qualifications: The erector shall have a minimum of 3 years experience in similar types of erection. Erector shall be able to furnish evidence of ability, facilities, and proficiency of personnel.
- E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1 for each process, position and joint configuration. Each operator shall have been qualified as prescribed by AWS and shall be approved by the New York City building department. Qualification performed more than six months prior to the start of the welding by the welder is acceptable, provided written documentation is submitted showing that the welder has continued to use the applicable welding process on an ongoing basis since the test was conducted, with no lapse in service exceeding six months.
1. Welder Certificates shall be submitted to the City of New York prior to welding.

2. Require welders to retake the qualification test if, as determined by the Commissioner or City of New York, there is a reasonable doubt as to the proficiency of the welder. If the welder does not requalify, he shall not perform any welding on the project.
 3. In addition to AWS D1.1 requirements on welder Qualification, qualify welders making welds with restricted access (such as welding the bottom flanges of girders to column flanges through cope or access holes in the girder webs) by using a mock-up assembly identical to the actual conditions of producing weldments in the field, using the approved WPS.
 4. Welder qualification shall include passing the bend test and Charpy tests when Charpy values are specified for the electrode.
- F. Comply with applicable provisions of the following specifications and documents:
1. AISC 303.
 2. AISC 360.
 3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- G. Preinstallation Conference: Prior to performing fabrication or erection work, there shall be a pre-fabrication and pre-erection meeting to review welding procedures, bolting procedures, and inspection requirements for all welding and bolting operations. The meeting shall include the following individuals: City of New York's Representative, Special Inspector, Steel Fabricator and Erector personnel supervising the shop, field and Quality Control work.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
1. Fasteners may be repackaged provided City of New York's testing and inspecting agency observes repackaging and seals containers.
 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.
- C. Requirements for storage and handling of electrodes shall be per AWS D1.1. Additional requirements include:
1. Long term storage of weld consumables shall be indoors, where moisture or dew does not collect, and in undamaged manufacturer's shipping bags, boxes, and containers.
 2. Open Flux Cored Arc Welding (FCAW) electrodes shall be completely covered during hours of non-use (i.e., weekends, nights of nonuse, days of nonuse, etc.). Where rain or dew could be expected to collect (i.e., open floors of erection site, open shop bays, etc.), electrodes shall also be covered.

1.10 COORDINATION

- A. Surveys: Contractor shall conduct field surveys and field verification as required to incorporate existing conditions of existing building to the work before shop drawings are produced.

- B. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.
- C. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.
- D. Notify the City of New York's Representative in sufficient time prior to shop or field fabrication or erection to permit testing and inspection without delaying work.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 80 percent.
- B. Material: As noted on drawings.

2.2 WELDING MATERIALS

- A. Welding Material: Filler metal requirements shall conform to AWS D1.1 and AISC "Specification for Structural Steel Buildings". Minimum classified tensile strength of 70 ksi (E70). Use low hydrogen electrodes as defined by AWS D1.1, unless noted otherwise.

2.3 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.
 - 1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.
- B. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
 - 1. Finish: Plain.
- C. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- D. Threaded Rods: A 572 Grade 50.
 - 1. Nuts: ASTM A 563 heavy-hex carbon steel.
 - 2. Washers: ASTM F 436, Type 1, hardened carbon steel.
 - 3. Finish: Plain.
- E. Structural Slide Bearings: Low-friction assemblies, of configuration indicated, that provide vertical transfer of loads and allow horizontal movement perpendicular to plane of expansion joint while resisting movement within plane of expansion joint.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings by Con-ServInc or comparable product by one of the following:
 - a. Amscot Structural Products Corp.
 - b. Fluorocarbon Company Limited.
 - c. R.J. Watson Bridge & Structural Engineered Systems.
 - d. Seismic Energy Products, L.P.

2.4 PRIMER

- A. Shop Paint: SSPC, Paint 20, Type I, Inorganic or Type II, Organic. Paint shall comply with the requirements of SSPC-PS 12.01.
 1. Primer paints shall be compatible with finishes and spray-on fireproofing specified elsewhere.

2.5 GROUT

- A. Grout shall have a minimum 2400 psi compressive strength in 48 hours and 6000 psi compressive strength at 28 days.
- B. Metallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.
- C. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
- D. Drypack Mortar: Composed of 1 part Portland cement and 2 parts of fine aggregate and water. Match color of adjacent surfaces.

2.6 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
 1. Camber structural-steel members where indicated.
 2. Fabricate beams with rolling camber up.
 3. Identify high-strength structural steel according to ASTM A 6 and maintain markings until structural steel has been erected.
 4. Mark and match-mark materials for field assembly.
 5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP2, "Hand Tool Cleaning".

- F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.
1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.7 SHOP CONNECTIONS

- A. General Bolting:
1. Product containers must be marked with lot numbers and traceability information so that correspondence with mill reports can be established. Manufacturer's symbol and grade markings shall appear on all bolts, nuts, through-hardened washers and direct tension indicators.
 2. Bolts shall be of a length that will extend to a point at least flush with the surface of the nuts, though not more than a length equal to the height of the nut, beyond the nuts unless otherwise noted.
 3. Bolts shall be installed with threads excluded from the shear plane.
 4. Washers shall be used on all bolts. Use beveled washers where bolts bear on sloping surface.
- B. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
1. Joint Type shall be as noted on drawings.
 2. Direct tension indicator (load indicating washers or "Tension-Set" bolts) method shall be used at slip-critical connections. "Turn-of-Nut" methods are *not* an acceptable alternative.
 3. When connection has bolts and welds, fully tighten bolts prior to welding with the exception that in moment connections the flange welds shall be completed prior to final tightening of high strength bolts.
 4. When already tensioned bolts have had their tension relaxed, replace the bolt and tension indicator and re-tighten.
- C. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
1. Shop welds shall be inspected in the shop before the work is painted or shipped.
 2. Weld sizes where shown shall be assumed to be effective weld sizes.
 3. All groove or butt welds shall be full penetration unless noted otherwise on the Drawings.
 4. Where structural steel members are to remain exposed in the finished work, welds exposed to view shall be uniformly made and ground smooth.
 5. Weld tabs shall be in accordance with AWS D1.1. In addition, weld tabs shall extend beyond the edge of the joint a distance equal to the plate thickness but not less than 1-inch except at access holes in beam/girder webs and at continuity plate clips. Weld tabs shall be oriented parallel to the joint preparation and to the weld direction. Weld dams are not allowed.
 6. Remove weld tabs and backup plates and grind surfaces smooth as required for inspection or testing. Where tabs or backup bars interfere with architectural treatment or are exposed to view in the final structure, remove and grind smooth. Backup bars and run-off tabs at Heavy Structural Sections shall be removed.
 7. Weld variables shall be consistent with the recommendations of the electrode manufacturer.

8. Do not weld into column flange-to-web intersection as defined the AISC "k" and "k1" distances except for the doubler plate to column welds. Continuity plate welds shall stay clear of this area as noted on the drawings.
9. Sequence the work as necessary to accommodate testing.
10. Welding Procedures:
 - a. Weld only in accordance with the Welding Procedure Specifications. WPS shall be readily available to all welders, inspectors, and supervisors during the production process.
 - b. Consider toughness and notch sensitivity of steel in formation of the welding procedures to prevent brittle and premature fracture during fabrication and erection. Toughness requirements are to match those of the parent metal.
 - c. Weld in a manner to minimize accumulation and concentration of through-thickness strains due to weld shrinkage. Sequence welds in a manner to reduce residual stresses (caused by welding) to a minimum value. Welding procedures shall incorporate measures necessary to eliminate cracking.
 - d. Do not mix different electrodes in the same weld joint unless the interactions have been shown not to cause problems.
 - e. Stringer passes only, no weaving or wash passes. Manipulation of the electrode for vertical welds (oscillation) shall be kept to a maximum movement of 4 to 5 electrode diameters.
 - f. Welding shall not begin until joint elements are bolted or tacked in intimate contact and adjusted to dimensions shown in the Drawings, with proper allowance for any weld shrinkage.
 - g. All tack welds shall be of the same quality as final welds. Preheat of tack welds is only necessary at the immediate area where the tack is placed. Preheat temperature is the same as for welding. Tack welds must be placed where they will be consumed in the weld, or be ground out to a depth of 1/8" but not rewelded unless the gouge is greater than 1/8". If rewelding is necessary, it shall then be considered a new weld with all relevant weld inspections.

2.8 SHOP PRIMING

- A. Structural steel not completely concealed by interior finishes shall receive a shop coat of primer except as follows:
 1. Surfaces embedded in concrete or mortar.
 2. Surfaces within 4 inches of field welds.
 3. Surfaces to be high-strength bolted with slip-critical connections.
 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 5. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 1. For steel that is to be enclosed or protected: SSPC-SP 2, "Hand Tool Cleaning."
 2. For steel that is to be exposed in the finished work for an extended period of time due to job site conditions: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.9 SOURCE QUALITY CONTROL

- A. Testing Agency: City of New York to perform special inspections and prepare test reports.
1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. See Part 1 of this specification for additional testing and inspection requirements. As a minimum the inspector will make all tests and inspections as required by the Special Inspection provisions of the New York City Building Code. City of New York will make all the tests and inspections indicated in the Contract Documents.
- C. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
1. Commissioner reserves right, at any time before final acceptance, to reject material not complying with requirements.
 2. Any tests that may be necessary to reconfirm any noncompliance of original work, and as may be necessary to show compliance of corrected work, shall be at Contractor's expense.
- D. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
1. High strength bolts specified as Snug-Tight need not be inspected for bolt tension. For high strength bolts specified as Slip-Critical, verify that 10% or a minimum of 2 bolts per connection are tensioned in accordance with the RCSC Specification.
 2. Direct Tension Indicators: Observe all Direct Tension Indicators to see if proper tightness was achieved.
- E. Welded Connections:
1. City of New York shall be present during all welding operations. In addition to visual inspection, all shop-welded connections will be tested and inspected according to AWS D1.1 and this specification using the following inspection procedures:
 - a. Liquid Penetrant Inspection (PT): ASTM E165.
 - b. Magnetic Particle Inspection (MT): ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection (UT): ASTM E164.
 - d. Radiographic Inspection (RT): ASTM E94.
 2. Visual Inspection of Welding: City of New York shall visually inspect all shop welding of structural steel accordance with the governing building code and AWS D1.1. Visual inspection of welds shall include but not be limited to the following:
 - a. Verify: Welding Procedure Specification (WPS) sheet has been provided and has been reviewed with each welder making the weld, welder qualification and identification, fit-up meets tolerances of WPS and mark joint prior to welding, welding consumables are per the Contract Documents and the WPS, amperage and voltage at the arc with hand-held meters, meters on welding equipment are functioning and accurate.
 - b. Observe preheat and interpass temperatures, weld pass sequence and size of weld bead.
 - c. Multi-pass welds shall be continuously inspected.
 - d. Visually inspect areas where backing bars and welds tabs are removed for conformance with the surface roughness criteria of the specifications.
 - e. Verify that the effective throat thickness of flare groove welds is consistently obtained when flush to bar or section. This verification shall be based on test sections where necessary.

3. Nondestructive Testing Requirements: City of New York shall perform non-destructive testing of shop and field welding in accordance with the project specifications, governing building code, and AWS D1.1. Extent of non-destructive testing shall be as follows:
 - a. Complete Joint Penetration (CJP) welds: UT 100% CJP welds greater than 5/16-inch. MT 25% all CJP welds.
 - b. Partial Penetration Joint (PPJ) welds: UT 100% of PJP welds greater than 5/16-inch. UT 100% PJP in column splices.
 - c. Fillet Welds: Fillet welds of gusset plates to beams, columns and base plates - MT 10% of the following fillet welds and reduce to 5% if no significant cracks are found in the first 50 tested: a) gusset plate fillet welds to beam and columns; b) base plate fillet welds.
 - d. Column Web Material at Continuity Plate: MT the WF column webs 3-inches above and below the weld terminations at the first 50 continuity plates and doubler plates installed. Test shall be conducted when weld has cooled to ambient temperature. If no web cracks are found, then no more testing required. This test shall also be conducted for all locations where the Contractor has welded into the "no weld" zone shown on the Drawings for continuity plates.
- F. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:
 1. Bend tests will be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.
- G. Inspection Records
 1. The inspector will maintain a daily record of the work that has been inspected and its disposition. One copy of each report will be submitted to the Owner on a weekly basis. Test reports will be made on the form suggested in the AWS D1.1 "Structural Welding Code".
 - a. Make systematic record of all welds, including:
 - b. Date of inspection.
 - c. Location and type of weld.
 - d. Identification marks of welders.
 - e. List of defective welds.
 - f. Manner of correction of defects.
- H. Mill Reports: Testing laboratory will review mill reports for conformance to referenced standard.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with steel Erector present, elevations of concrete bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
 1. Prepare a certified survey of bearing surfaces, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
1. The Contract Drawings indicate the completed structure. The Contractor is fully responsible for all temporary measures necessary for erection, except where specific sequences and requirements are specified on the Drawings.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Base Plates: Clean concrete-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
1. Set plates for structural members on wedges, shims, or setting nuts as required.
 2. Weld plate washers to top of baseplate.
 3. Snug-tighten post-installed anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Care shall be taken to protect work already installed from damages resulting from structural steel erection.
- E. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
- F. Splice members only where indicated.
- G. Do not use thermal cutting during erection unless approved by Commissioner. Finish thermally cut sections within smoothness limits in AWS D1.1.
- H. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- I. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

- B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 1. Weld in manner to prevent warping or distortion of finished product. Use jigs which will not restrain piece from moving during welding or cooling after welding. Sequence weld passes at a joint to prevent excessive heat build-up or cause shrinkage cracks to form.
 2. Preheat and post-heat procedures for welded joints shall be utilized to prevent rapid cooling of welds, particularly in cold weather. Procedures are Contractor's responsibility.
- C. Shear Studs: The shear studs shall be automatically end welded in accordance with AWS D1.1 and the manufacturer's recommendations in such a manner as to provide complete fusion between the end of the stud and the plate.
1. There should be no porosity or evidence of lack of fusion between the welded end of the stud and the plate.
 2. Shear studs through metal deck shall be welded through the deck within 1 day of laying the deck.
- D. Bearing Pads: Install bearing pads in accordance with manufacturer's recommendations.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: City of New York to inspect field welds and high-strength bolted connections.
- B. Field quality control shall, as a minimum, conform to the requirements specified under Source Quality Control in Part 2.
- C. Bolted Connections: Bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
1. High strength bolts specified as Snug-Tight need not be inspected for bolt tension. For high strength bolts specified as Slip-Critical, verify that 10% or a minimum of 2 bolts per connection are tensioned in accordance with the RCSC Specification.
 2. Direct Tension Indicators: Observe all Direct Tension Indicators to see if proper tightness was achieved.
- D. Welded Connections: Field welds will be visually inspected according to AWS D1.1.
1. In addition to visual inspection, field welds will be tested and inspected according to AWS D1.1 and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- E. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1 for stud welding and as follows:
1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.
- F. Defective Work:

1. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents. Work deemed defective will be removed from the site at the Contractor's expense.
2. Any special tests not specifically covered by this specification that are proposed by the Contractor as a result of failure to comply with this Section shall be at the Contractor's expense. The Contractor shall be responsible for any consequential costs or delays.
3. The results of those tests will be accepted, at the discretion of the Commissioner, as proof of adequate materials or workmanship.

3.6 REPAIRS AND PROTECTION

- A. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

END OF SECTION 051200

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SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Composite floor deck.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for lightweight structural concrete fill over steel deck.
 - 2. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors.
 - 3. Section 055000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.3 ACTION SUBMITTALS

- A. General:
 - 1. Submit shop drawings for review and obtain acceptance prior to start of fabrication.
 - 2. Review of submittals if of a general nature only, and responsibility for conformance with the intent of the Contract Documents shall remain with the Contractor. Review does not imply nor state that fabricator has correctly interpreted the Contract Drawings.
- B. Product Data: For each type of deck, accessory, and product indicated.
- C. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- D. Shop Drawings:
 - 1. Prepare decking plans showing deck profile and gauge, sheet layout, supports, method of attachment, edge details, supplemental framing, openings and reinforcement, projections and accessories.
 - 2. Show type and location of welds and other fasteners.
 - 3. Show where shoring and supplemental framing of deck is needed. Shoring of deck is the responsibility of the Contractor. This includes determining whether shoring is needed, and if needed, the design of the shoring. Contractor shall consider concentrated loads from concrete and crews when investigating the need for shoring.
 - 4. Include vertical load capacity and diaphragm/weld values.
 - 5. Show the quantity, pattern, spacing and configuration of the shear studs for each beam.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding:
 - 1. Welding Procedure Specifications (WPS) for all types of welds in this section.
 - 2. Certificate showing that welder has passed qualification tests.
 - 3. Welding electrodes certificate of compliance.
- B. Product Certificates: For each type of steel deck, submit to the Testing Agency the mill test certificates signed by product manufacturer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
 - 1. Power-actuated mechanical fasteners.
- D. Field quality-control and inspection reports.
- E. Research/Evaluation Reports: ICC-ES Evaluation Report for each deck type showing allowable superimposed loads values and diaphragm shear values that equal or exceed the requirements of the Contract Documents.

1.5 QUALITY ASSURANCE

- A. Testing Agency: City of New York will perform special inspections and prepare test reports and shall be qualified according to ASTM E 329 for testing indicated.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."
- C. Comply with applicable provisions of the following specifications and documents, except where more stringent requirements are shown or specified:
 - 1. AISI Specification, "North American Specification for the Design of Cold Formed Steel Structural Members".
 - 2. SDI Publication No. 31, "Design manual for Composite Decks, Form Decks, and Roof Decks".
 - 3. American Welding Society (AWS) D1.3, "Structural Welding Code - Sheet Steel"
 - 4. New York City Building Code

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling. Materials showing evidence of damage will be rejected and shall be immediately removed from the site.
- B. Store steel deck off of ground and provide drainage. Protect steel deck with a waterproof covering and ventilate to avoid condensation.
- C. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.
- D. Each bundle of fabricated elements shall be marked or tagged so as to note ASTM specification number, style, and grade.

- E. Do not overload decking during construction period and do not use decking for storage or working platform prior to welding in position.
- F. Where deck is exposed to view in the completed structure use special care to prevent damage to decking.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 65 percent.

2.2 COMPOSITE FLOOR DECK

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Canam United States; Canam Group Inc.
 - 2. Nucor Corp.; Vulcraft Group.
 - 3. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.
- B. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
 - 1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G30 zinc coating.
 - 2. Profile Depth: As indicated on Contract Drawings.
 - 3. Design Uncoated-Steel Thickness: Not less than 0.0295-inches. As indicated on Contract Drawings.
 - 4. Span Condition: As indicated on Contract Drawings.
 - 5. Side laps: As indicated on Contract Drawings.

2.3 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

- F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.
- G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
- H. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

2.4 FABRICATION

- A. Provide in lengths to be continuous for three spans and rest on a minimum of four supports, wherever steel layout permits. Where decking cannot be continuous for two spans, increase deck gauge as required to support temporary and permanent loads at acceptable deflections.
- B. Cantilevered units shall have the cantilever and at least the adjacent span in one length.
- C. Fabricate such that end joints occur over supporting members.
- D. Sheets parallel to and at the perimeter of the deck shall be full width sheets.
- E. Allowable Construction Load on Deck: Construction loads on deck shall not exceed carrying capacity of decks. Contractor is responsible for checking the adequacy of both steel decks and composite concrete filled decks for their ability to support all construction loads plus the wet weight of concrete.
- F. Tolerances:
 - 1. Panel length: Plus or minus ½ inch.
 - 2. Thickness of deck units: Not less than 95 percent of the specified thickness.
 - 3. Panel camber: ¼ inch in 10 foot length.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance:
 - 1. Check supporting members for correct layout and alignment.
 - 2. Verify that surfaces to receive floor deck are free of debris.
- B. Discrepancies
 - 1. In the event of discrepancy, immediately notify the Commissioner.
 - 2. Do not proceed with installation in areas of discrepancy until such discrepancies have been fully resolved

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
 - 1. Where openings do not need reinforcements (exclusive of trim bars in concrete) do not cut deck until concrete has cured.
 - 2. Unless both edges of openings perpendicular to deck span are supported by a beam, do not cut opening until concrete has cured.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 FLOOR-DECK INSTALLATION

- A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
 - 1. Weld Diameter: As indicated on Contract Drawings.
 - 2. Weld Spacing: Space and locate welds as indicated.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span or 36 inches, and as follows:
 - 1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
 - 2. Mechanically clinch or button punch.
 - 3. Fasten with a minimum of 1-1/2-inch-long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches with end joints as follows:
 - 1. End Joints: Butted.
- D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.
- E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: City of New York to perform tests and inspections.
- B. Field welds will be subject to inspection as required by AWS D1.3 and New York City Building Code.

- C. City of New York will be provided with:
 - 1. A complete set of accepted "Submittals".
 - 2. Representative sample pieces as requested by the Testing Agency.
 - 3. Full and ample means and assistance for testing all material.
 - 4. Access and facilities, including scaffolding, temporary work platforms, etc., for testing and inspection at all places where materials or components are stored or fabricated, and also in their erected position.

- D. Scheduling of Tests and Inspections: The Contractor shall notify the City of New York in sufficient time prior to fabrication or erection work to allow testing and inspection without delaying the work.

- E. City of New York will conduct the following special inspections:
 - 1. Inspect the steel deck installation as required by the building code and AWS D1.3.
 - 2. Review WPS for compliance with the project specifications.
 - 3. Review Manufacturer Test Reports and Certifications for compliance with the project specifications.
 - 4. Review welder qualifications in accordance with the project specifications.
 - 5. Report inspection results promptly and in writing to Contractor and Commissioner.

- F. Remove and replace work that does not comply with specified requirements.

- G. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.5 PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

- B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 053100

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide metal fabrications in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:
1. Miscellaneous steel framing and supports for countertops, mechanical and electrical equipment, and locations where framing and supports are not specified in other Sections.
 2. Rough hardware.
 3. Steel weld plates and angles for casting into concrete.
 4. Loose bearing and leveling plates.
 5. Floor grating platforms and treads (catwalks) with railing system as indicated.
- B. Products furnished, but not installed, under this Section:
1. Loose steel lintels.
 2. Anchor bolts, steel pipe sleeves, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
- C. Related Sections:
1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
 2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
 3. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.4 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:

1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
 2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.
- B. Product Data: Submit manufacturer's technical data, installation instructions and finish requirements for metal fabrications and the following:
1. Paint products.
 2. Grout.
- C. Shop Drawings: Show fabrication and installation details for metal fabrications.
1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
- D. Welding Certificates: Signed by Contractor certifying that welders comply with AWS requirements.
- E. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
- 1.5 QUALITY ASSURANCE
- A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the Work.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1, "Structural Welding Code - Steel."
- 1.6 PROJECT CONDITIONS
- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.
- 1.7 COORDINATION
- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

- B. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36.
- B. Steel Pipe: ASTM A 53, standard weight (Schedule 40) unless otherwise indicated.
- C. Steel Tubing: ASTM A 500, cold-formed steel tubing.
- D. Steel Bars for Bar Gratings: ASTM A 36 or steel strip, ASTM A 1011 or ASTM A 1018.
- E. Wire Rod for Bar Grating Crossbars: ASTM A 510.
- F. Cast Iron: Either gray iron, ASTM A 48, or malleable iron, ASTM A 47, unless otherwise indicated.
- G. Slotted Channel Framing (Unistrut): Cold-formed metal box channels (struts) complying with MFMA-4.
 - 1. Size of Channels: 1-5/8 by 1-5/8 inches, or as indicated on the Drawings.
 - 2. Material: Cold-rolled steel, ASTM A 1008, either commercial steel, Type B or structural steel, Grade 33; 0.060-inch minimum thickness; hot-dip galvanized after fabrication

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.
- D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- E. Eyebolts: ASTM A 489.

- F. Machine Screws: ASME B18.6.3.
- G. Lag Screws: ASME B18.2.1.
- H. Wood Screws: Flat head, ASME B18.6.1.
- I. Plain Washers: Round, ASME B18.22.1.
- J. Lock Washers: Helical, spring type, ASME B18.21.1.
- K. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
- L. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47 malleable iron or ASTM A 27 cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- M. Post-Installed Anchors: Torque-controlled expansion anchors.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Locations where Stainless Steel is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Shop Primers: Provide primers that comply with Division 9 Section "Painting".
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
 - 1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units to sizes, shapes, and profiles indicated and required to receive other adjacent construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.
- C. Fabricate supports for countertops from steel angles, channels, anchors and fastener of length, size, and profile, as indicated on Drawings or as selected by Commissioner. Provide additional accessories as required for complete assembly.
- D. Galvanize miscellaneous framing and supports in the following locations:
 - 1. Interior locations where indicated.

2.7 ROUGH HARDWARE

- A. Furnish bent, or otherwise custom-fabricated, bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting rough carpentry, and for anchoring or securing rough carpentry to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 Section "Rough Carpentry".
- B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts that bear on wood structural connections, and furnish steel washers elsewhere.

2.8 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with not less than two integrally welded steel strap anchors for embedding in concrete.
- B. Provide formed or bent steel plates for anchoring concrete masonry wall units to supporting beams and framing.
 - 1. Galvanize steel weld plates, unless otherwise indicated.

2.9 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize plates after fabrication.

2.10 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels for equal bearing of 1 inch per foot of clear span but not less than 8 inches bearing at each side of openings, unless otherwise indicated.
 - 1. Provide two angles at all openings in 8" walls unless otherwise indicated.
 - 2. Add one angle for each additional 4" or masonry wall.
- C. Galvanize loose steel lintels located in exterior walls.

2.11 CATWALKS

- A. General: Provide catwalk assemblies as indicated on the drawings, including railings and other supports.
- B. Catwalks shall be fabricated from cold rolled steel tread plate and steel gratings, with steel hangers, framing members and pipe railings.
 - 1. Provide gratings of patterns, sizes, and spacing bar sizes indicated complying with NAAMM "Metal Bar Grating Manual".

2. Fabricate grating treads with steel plate nosing on one edge and with steel angle or steel plate carrier at each end for string connections.
- C. Provide catwalks with side braces and all other accessories required for a rigid and secure installation.
- D. Removable Grating Sections: Fabricate with banding bars attached by welding to entire perimeter of each section. Include anchors and fasteners of type indicated or, if not indicated, as recommended by manufacturer for attaching to supports.
- E. Railings: Comply with specified requirements for steel pipe railings.
1. General: Fabricate pipe railings and handrails to comply with requirements indicated for design, details, and sizes, but not less than that required to support structural loads.
 2. Interconnect railing and handrail members by butt-welding or welding with internal connectors, at fabricator's option.
 - a. At intersections, notch ends of intersecting members to fit contour of pipe to which end is joined and weld all around.
 3. Bend pipe to produce uniform curvature for each repetitive shape required; maintain cylindrical cross-section of pipe throughout entire bend without deforming pipe.
 4. Provide wall returns at ends of wall-mounted handrails, unless otherwise shown.
 5. Close exposed ends of pipe by welding 3/16 inch thick steel plate in place or by use of prefabricated fittings. Grind edges smooth, with 1/8" minimum radius.
 6. Provide toe boards at railings at the edge of open-sided grating and platforms. Use 4 inches high x 1/8 inch steel plate welded to, and centered between each railing post, unless otherwise indicated.
 7. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnections of pipe and attachment to other work.
 - a. For railing posts set in concrete, provide steel pipe sleeves not less than 6 inches long and not less than 1/2 inch larger than the post, with steel plate welded to bottom of sleeve.
 - b. For railing posts set on concrete, provide anchor bolts, plates and miscellaneous fasteners required to through bolt the railing post anchorages through the concrete slabs, as indicated.
 8. For interior steel railings with primer finish, provide primed metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete.

2.12 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.
- C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.13 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153 for steel and iron hardware and with ASTM A 123 for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
 - 2. Galvanize all exterior steel unless otherwise indicated.
- B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with universal shop primer unless otherwise indicated.
- C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
 - 1. Interior Items Indicated to Receive High-Performance Finish: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning "
 - 2. Other Interior Items: SSPC-SP 3, "Power Tool Cleaning."
- D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
- E. Field Painted Finish: Refer to Division 9 Section "Painting" for products and application of field painted surfaces and substrates.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for operable partitions securely to and rigidly brace from building structure.
- C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
 - 1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified below in "Installing Bearing and Leveling Plates" Article.
- D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified below in "Installing Bearing and Leveling Plates" Article.
 - 1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
 - 1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations unless otherwise indicated.
 - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

- C. Protect finishes of decorative metal from damage during construction period with temporary protective coverings approved by decorative metal fabricator. Remove protective covering at time of Substantial Completion.
- D. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 055000

SECTION 055100 - METAL STAIRS

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide steel stairs in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:
1. Preassembled steel stairs with perforated metal risers and concrete-filled treads.
 2. Preassembled steel pan stairs with concrete-filled treads.
- B. Refer to Division 5 Section "Handrails and Railings" for railing assemblies integral to metal stairs specified in this Section.
- C. Related Sections:
1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
 2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
 3. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design metal stairs, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
1. Uniform Load: 100 lbf/sq. ft.
 2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
 3. Uniform and concentrated loads need not be assumed to act concurrently.
 4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
 5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch, whichever is less.
- C. Seismic Performance: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. Component Importance Factor is 1.5.

1.4 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:
1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
 2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.
- B. Product Data: Submit product data that verify or are required to ensure compliance with the Contract Documents, to include technical information, shop drawings, samples, calculations, product test reports, etc.
- C. Shop Drawings: Submit shop drawings including plans, elevations, sections, details, and attachments to other work.
1. Provide templates for anchors and bolts specified for installation under other Sections.
 2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for stairs.
- E. Welding Certificates: Certification that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.5 QUALITY ASSURANCE

- A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.
1. Preassembled Stairs: Commercial class.
- B. Welding: Qualify procedures and personnel according to the following:
1. AWS D1.1, "Structural Welding Code--Steel."
 2. AWS D1.3, "Structural Welding Code--Sheet Steel."

- C. Professional Engineer Qualifications: Professional engineer legally authorized to practice in the State of New York and experienced in providing engineering services of the kind indicated for metal stair systems similar in material, design, and extent to that indicated for this Project and that have a record of successful in-service performance.

1.6 COORDINATION

- A. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Coordinate locations of hanger rods and struts with other work so that they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36.
- B. Steel Tubing: ASTM A 500 (cold formed) or ASTM A 513.
- C. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011, either commercial steel, Type B, or structural steel, Grade 30, unless another grade is required by design loads.
- D. Perforated Metal (Risers): Stainless-steel sheet, complying with ASTM A 240 or A666, Type 316; 0.0747 inch thick, with 1/4-inch holes, 3/8 inch o.c. in staggered rows, 40% open.

2.3 FASTENERS

- A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 25 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F 1554, Grade 36.
 - 1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts for stairs indicated to be galvanized.
- D. Machine Screws: ASME B18.6.7.
- E. Lag Bolts: ASME B18.2.3.8.
- F. Plain Washers: Round, ASME B18.22.

- G. Lock Washers: Helical, spring type, ASME B18.21.2.
- H. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer; and compatible with topcoat.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- E. Precast Concrete Treads: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, ready-mixed concrete with a minimum 28-day compressive strength of 5000 psi and a total air content of not less than 4 percent or more than 6 percent.
 - 1. Reinforcing: Fiberglass reinforced.

2.5 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
 - 1. Join components by welding unless otherwise indicated.
 - 2. Use connections that maintain structural value of joined pieces.
- B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Form exposed work with accurate angles and surfaces and straight edges.
- F. Weld connections to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. Weld exposed corners and seams continuously unless otherwise indicated.
 5. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.
- H. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.6 STEEL-FRAMED STAIRS STEEL STAIRS

A. Stair Framing:

1. Fabricate stringers of steel plates or channels.
2. Construct platforms of steel plate or channel headers and miscellaneous framing members as indicated or needed to comply with performance requirements.
3. Weld stringers to headers; weld framing members to stringers and headers.

B. Metal-Pan Stairs with Decorative Risers: Form subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.067 inch.

1. Steel Sheet: Uncoated hot-rolled steel sheet unless otherwise indicated.
2. Directly weld metal pans to stringers; locate welds on top of subtreads where they will be concealed by concrete fill. Do not weld risers to stringers.
3. Form risers from perforated stainless steel sheet. Attach risers and subtreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.
 - a. Orient perforated metal with pattern as indicated on the Drawings.
4. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.

C. Metal-Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.067 inch.

1. Steel Sheet: Uncoated hot-rolled steel sheet unless otherwise indicated.
2. Directly weld metal pans to stringers; locate welds on top of subtreads where they will be concealed by concrete fill. Do not weld risers to stringers.
3. Attach risers and subtreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.
4. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.
5. Smooth Soffit Construction: Construct subplatforms with flat metal under surfaces to produce smooth soffits.

- D. Refer to Division 5 Sections "Handrails and Railings" for materials and fabrication of railing assemblies in compatible with metal stairs specified in this Section.

2.7 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal stairs after assembly.
- C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- D. Apply shop primer to uncoated surfaces of metal stair components, except those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
- E. Finish Coats: Refer to Division 09 Section "Painting" for materials and performance of field applied paint finishes.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete, unless otherwise indicated.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- E. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Place and finish concrete fill for treads and platforms to comply with Division 3 Section "Cast-in-Place Concrete."
- G. Install precast concrete treads with adhesive supplied by manufacturer.

3.2 INSTALLING METAL STAIRS WITH GROUTED BASEPLATES

- A. General: Provide where indicated on the Drawings or as otherwise directed by the Commissioner.
- B. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of baseplates.
- C. Set steel stair baseplates on wedges, shims, or leveling nuts. After stairs have been positioned and aligned, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
 - 1. Use nonmetallic, nonshrink grout unless otherwise indicated.
 - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 INSTALLATION OF HANDRAILS AND RAILINGS

- A. Refer to Division 5 Section "Handrails and Railings" for installation of railing assemblies compatible with metal stairs specified in this Section.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

END OF SECTION 055100

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SECTION 057000 - DECORATIVE METAL

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide decorative metal in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Interior aluminum angles, reveals, and trims.
2. Interior stainless steel cladding.

- B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction Waste Management".
4. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:

1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.

3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.
- B. Product Data: For each type of product indicated, include construction details, material descriptions, dimensions of individual components and profiles, and finishes for decorative metal.
- C. Shop Drawings: Show fabrication and installation details for decorative metal.
1. Include plans, elevations, component details, and attachments to other work.
 2. Indicate materials and profiles of each decorative formed metal member, fittings, joinery, finishes, fasteners, anchorages, and accessory items.
- D. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.
- E. Samples for Verification: For each type of exposed finish required, prepared on 6 inch square Samples of metal of same thickness and material indicated for the Work.
- F. Coordination Drawings: For decorative formed metal elements that house items specified in other Sections. Show dimensions of housed items, including locations of housing penetrations and attachments, and necessary clearances.
- G. Mill Certificates: Signed by stainless-steel manufacturers certifying that products furnished comply with requirements.
- H. Maintenance Data: Submit manufacturer's maintenance instructions or recommendations for decorative metal to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing decorative formed metal similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Anodic Finisher Qualifications: A firm experienced in successfully applying anodic finishes of type indicated and that employs competent control personnel to conduct continuing, effective quality-control program to ensure compliance with requirements.
- C. Powder-Coating Applicator Qualifications: A firm experienced in successfully applying powder coatings of type indicated to metals of types indicated and that employs competent control personnel to conduct continuing, effective quality-control program to ensure compliance with requirements.
- D. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.2, "Structural Welding Code - Aluminum."
 2. AWS D1.6, "Structural Welding Code - Stainless Steel."
- E. Mock-Up: Prior to start of work, provide mock-ups of each type and finish of specified units, including all accessories and hardware with specified finishes to be used in the finished Work. Provide mock-ups of units in locations as directed by the Commissioner. Obtain Commissioner's acceptance of mock-up's visual quality and workmanship before start of work. Retain accepted mock-ups as a standard for judging Work of this Section.
- F. Preinstallation Conference: Conduct conference at Project site.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Deliver decorative formed metal products wrapped in protective coverings and strapped together in suitable packs or in heavy-duty cartons. Remove protective coverings before they stain or bond to finished surfaces.
 - B. Store products on elevated platforms in a dry location.
- 1.7 PROJECT CONDITIONS
- A. Field Measurements: Verify actual locations of walls, columns, beams, and other construction contiguous with decorative formed metal by field measurements before fabrication and indicate measurements on Shop Drawings.
 1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating ornamental metalwork without field measurements. Coordinate other construction to ensure that actual dimensions correspond to guaranteed dimensions.
- 1.8 COORDINATION
- A. Coordinate installation of anchorages for decorative formed metal items. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
 - B. Coordinate installation of decorative formed metal with adjacent construction to ensure that wall assemblies, flashings, trim, and joint sealants, are protected against damage from the effects of weather, age, corrosion, and other causes.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties for each aluminum form required not less than that of alloy and temper designated below.
 1. Extruded Bars and Shapes: ASTM B 221, Alloy 6063-T5/T52.
 2. Plate and Sheet: ASTM B 209, Alloy 5005-H32 or 6061-T6.
 3. Die and Hand Forgings: ASTM B 247, Alloy 6061-T6.
 4. Castings: ASTM B 26, Alloy A356.0-T6.

B. Stainless Steel:

1. Tubing: ASTM A 554, Grade MT 304 or 316.
2. Pipe: ASTM A 312, Grade TP 304 or 316.
3. Castings: ASTM A 743, Grade CF 8 or CF 20.
4. Sheet, Strip, Plate, and Flat Bar: ASTM A 666, Type 304 or 316.
5. Bars and Shapes: ASTM A 276, Type 304 or 316.

2.2 MISCELLANEOUS MATERIALS

- A. Gaskets: As required to seal joints in decorative formed metal and remain weathertight; as recommended in writing by decorative formed metal manufacturer.
1. ASTM D 1056, Type 1, Class A, grade as recommended by gasket manufacturer to obtain seal for application indicated.
 2. Closed-cell polyurethane foam, adhesive on two sides, release paper protected.
- B. Sealants, Interior: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C 834; of type and grade required to seal joints in decorative formed metal; and as recommended in writing by decorative formed metal manufacturer.
- C. Filler Metal and Electrodes: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded or brazed and as necessary for strength, corrosion resistance, and compatibility in fabricated items.
1. Use filler metals that will match the color of metal being joined and will not cause discoloration.
- D. Fasteners: Fabricated from same basic metal and alloy as fastened metal unless otherwise indicated. Do not use metals that are incompatible with materials joined.
1. Provide concealed fasteners for interconnecting decorative formed metal items and for attaching them to other work unless exposed fasteners are unavoidable or are the standard fastening method.
 2. Provide Phillips or square or hex socket flat-head machine screws for exposed fasteners unless otherwise indicated.
- E. Structural Anchors: For applications indicated to comply with certain design loads, provide chemical or torque-controlled expansion anchors with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
- F. Nonstructural Anchors: For applications not indicated to comply with design loads, provide powder-actuated fasteners or metal-impact expansion anchors of type, size, and material necessary for type of load and installation indicated, as recommended by manufacturer, unless otherwise indicated.
- G. Anchor Materials:
1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
 2. Material Where Stainless Steel Is Indicated: Alloy Group 1 or 2 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

- H. Backing Materials: Provided or recommended by decorative metal manufacturer.
- I. Laminating Adhesive: Adhesive recommended by metal fabricator that will fully bond metal to metal and that will prevent telegraphing and oil canning and is compatible with substrate and noncombustible after curing.
- J. Isolation Coating: Manufacturer's standard alkali-resistant coating or bituminous paint.
- K. Sound-Deadening Mastic: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.3 PAINTS AND COATINGS

- A. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble decorative formed metal items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Coordinate dimensions and attachment methods of decorative formed metal items with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned unless otherwise indicated.
- C. Form metal to profiles indicated, in maximum lengths to minimize joints. Produce flat, flush surfaces without cracking or grain separation at bends. Fold back exposed edges of unsupported sheet metal to form a 1/2 inch wide hem on the concealed side, or ease edges to a radius of approximately 1/32 inch and support with concealed stiffeners.
- D. Increase metal thickness or reinforce with concealed stiffeners, backing materials, or both, as needed to provide surface flatness equivalent to stretcher-leveled standard of flatness and sufficient strength for indicated use.
 - 1. Support joints with concealed stiffeners as needed to hold exposed faces of adjoining sheets in flush alignment.
- E. Build in straps, plates, and brackets as needed to support and anchor fabricated items to adjoining construction. Reinforce decorative formed metal items as needed to attach and support other construction.
- F. Provide support framing, mounting and attachment clips, splice sleeves, fasteners, and accessories needed to install decorative formed metal items.
- G. Where welding is indicated, weld joints and seams continuously. Grind, fill, and dress to produce smooth, flush, exposed surfaces in which joints are not visible after finishing is completed.
 - 1. Use welding procedures that will blend with and not cause discoloration of metal being joined.

2.5 COVERS, PANELS, CLADDING, AND TRIM

- A. Panels, Cladding and Trims: Form panels, cladding and trims from metal of type and thickness as indicated on the Drawings and Finish Schedules, or as directed by the Commissioner. Fabricate to fit tightly to adjoining construction. Assemblies shall be fabricated with tight hairline joinery. Assemblies shall be free from grain separation. Factory assembled components shall be fully welded assemblies with joints ground smooth prior to finishing to match sheet texture of the closure/filler fabrication. Where joinery does not permit a fully welded joint, as a result of specific conditions, as well as to accommodate thermal induced movements, provide sealant type joints where indicated.
1. Materials: Provide stainless sheet or plate panels of thicknesses indicated, but not less than required to prevent distortions, oil-canning, warping, telegraphing of substrates and other imperfections.
 2. Refer to the Drawings and Material Schedules for metal base material, size, and finish.
- B. Form closures and trim from metal of type and thickness indicated below. Fabricate to fit tightly to adjoining construction, with weathertight joints at exterior installations.
1. Closures and trim may be fabricated from prefinished metal sheet in lieu of finishing after fabrication provided unfinished edges are concealed from view and not exposed to weather.
- C. Conceal fasteners where possible; otherwise, locate where they are as inconspicuous as possible. Size fasteners to support closures and trim, with fasteners spaced to prevent buckling or waviness in finished surfaces.
- D. Drill and tap holes needed for securing closures and trim to other surfaces.
- E. Incorporate gaskets where indicated or needed for concealed, continuous seal at abutting surfaces.
- F. Miter or cope trim members at corners and reinforce with bent metal splice plates to form tight joints.

2.6 REVEALS, ANGLES AND TRIM

- A. Fabricate metal reveals, angles and trims from brake-formed, aluminum members. Drill for mounting screws 6 inches from ends of units and not more than 24 inches o.c. Locate mounting screws at same heights for all reveals. Provide hex-socket, wafer-head screws for mounting reveals.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Complete mechanical finishes of flat sheet metal surfaces before fabrication where possible. After fabrication, finish all joints, bends, abrasions, and other surface blemishes to match sheet finish.
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

- D. Apply anodic finishes to formed metal after fabrication unless otherwise indicated.
- E. Finish items indicated on Drawings after assembly.
- F. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2.9 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
- C. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of decorative formed metal.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Locate and place decorative formed metal items level and plumb and in alignment with adjacent construction. Perform cutting, drilling, and fitting required to install decorative formed metal.
 - 1. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where needed to protect metal surfaces and to make a weathertight connection.
- C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers as indicated.

- D. Install concealed gaskets, joint fillers, sealants, and insulation, as the Work progresses, to make interior decorative formed metal items soundproof or lightproof as applicable to type of fabrication indicated.
- E. Corrosion Protection: Apply bituminous paint or other permanent separation materials on concealed surfaces where metals would otherwise be in direct contact with substrate materials that are incompatible or could result in corrosion or deterioration of either material or finish.

3.3 ADJUSTING AND CLEANING

- A. Unless otherwise indicated, clean metals by washing thoroughly with clean water and soap, rinsing with clean water, and drying with soft cloths.
- B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- C. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 Section "Painting".
- D. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

3.4 PROTECTION

- A. Protect finishes of decorative formed metal items from damage during construction period. Remove temporary protective coverings at time of Substantial Completion.

END OF SECTION 057000

SECTION 057113 - FABRICATED METAL SPIRAL STAIRS

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide spiral stairs in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Fabricated spiral stairs with steel central-supporting columns and radiating treads.

- B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction Waste Management".
4. Division 1 Section "Construction IAQ Requirements".
5. Division 9 Section "Carpeting" for carpet treads on stairs.

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design fabricated spiral stairs, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

- B. Structural Performance of Stairs: Fabricated spiral stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to SEI/ASCE 7:

1. Uniform Load: 100 lbf/sq. ft.
2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Railing Loads: Stairs shall withstand stresses resulting from railing loads in addition to loads specified above.

- C. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to SEI/ASCE 7:

1. Handrails:

- a. Uniform load of 50 lbf/ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
2. Top Rails of Guards:
- a. Uniform load of 50 lbf/ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
3. Infill of Guards:
- a. Concentrated load of 200 lbf applied horizontally on an area of 1 sq. ft.
 - b. Uniform load of 25 lbf/sq. ft. applied horizontally.
 - c. Infill load and other loads need not be assumed to act concurrently.

1.4 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:
1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
 2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review
- B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for components.
- C. Shop Drawings: For fabricated spiral stairs. Include plans, elevations, sections, details, and attachments to other work.
1. Provide templates for anchors, bolts, and other anchorage devices specified for installation under other Sections.
- D. Samples for Initial Selection: For products involving selection of color, texture, or design.
- E. Samples for Verification: For the following products, in manufacturer's standard sizes:
1. Treads.
 2. Metal with painted finish.
 3. Railing members.

- F. Delegated-Design Submittal: For fabricated spiral stairs indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - G. Welding certificates.
- 1.5 QUALITY ASSURANCE
- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."
- 1.6 COORDINATION
- A. Coordinate installation of anchorages for fabricated spiral stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Accent Stairs.
 - 2. Iron Shop (The).
 - 3. Mylen Stairs.
 - 4. Spiral Stairs of America.
 - 5. Approved equal.

2.2 MATERIALS

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Same metal and finish as supported item unless otherwise indicated.
- C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- D. Steel Bars for Grating Treads and Platforms: ASTM A 36 or ASTM A 1011.
- E. Wire Rod for Grating Crossbars: ASTM A 510.
- F. Rolled-Steel Floor Plate: ASTM A 786, rolled from plate complying with ASTM A 36 or ASTM A 283, Grade C or Grade D.
- G. Steel Pipe Columns: ASTM A 53, Schedule 40. Provide Schedule 80 for columns larger than NPS 4 and where required to support loads.
- H. Steel Pipe Railings: ASTM A 53, Schedule 40.

- I. Steel Tubing: Either cold-formed steel tubing complying with ASTM A 500 or mandrel-drawn mechanical tubing complying with ASTM A 513, Type 5.
- J. Iron Castings: Either gray iron complying with ASTM A 48/A 48M or malleable iron complying with ASTM A 47/A 47M unless otherwise indicated or required by structural loads.

2.3 MISCELLANEOUS MATERIALS

- A. Fasteners: For connecting stair components and for anchoring stairs to other construction, select fasteners of the type, grade, and class required to produce connections capable of withstanding design loadings.
 - 1. For aluminum, provide fasteners fabricated from Type 304 stainless steel.
 - 2. For steel and cast iron, use plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
- B. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer, compatible with finish paint systems indicated.
- C. Sound Isolation: Neoprene pads of size and type as indicated. Provide at connections for acoustical and vibration resistance.

2.4 FABRICATION

- A. Assemble spiral stairs in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form work true to line and level with accurate angles and surfaces.
- D. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- E. Cut, reinforce, drill, and tap as needed to receive hardware, screws, and similar items.
- F. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. Provide Type 2 or Type 3 welds according to NOMMA Guideline 1, "Joint Finishes."
 - 5. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and, except for fillet welds, welded surface matches contours of adjoining surfaces.

- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.
- H. Fabricate center column from steel pipe welded to baseplate for anchorage to floor structure. Brace column at upper floors by means of landings attached to column and floor structure unless otherwise indicated. Provide cap for column if top is exposed.
- I. Provide formed steel-plate treads and platforms welded to hubs or center column and as follows:
 - 1. Pan treads without legs.
- J. Carpet Treads: Refer to Division 9 Section "Carpeting" for materials and installation of carpet treads.
- K. Railings: Provide railing system indicated, uniformly bent to spiral shape, and continuing at top to form guardrail around floor opening.
 - 1. Space balusters as indicated on the Drawings.
 - 2. Fabricate top rail from 1-1/2 OD steel pipe or round tubing.
 - 3. Fabricate balusters from minimum 1-1/2 inch OD steel pipe or round tubing.

2.5 STEEL AND IRON FINISHES

- A. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC's surface-preparation specifications and environmental exposure conditions of installed stairs:
 - 1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Interiors (SSPC Zone 1A): SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
- B. Apply shop primer to prepared surfaces of handrails and railing components unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where needed for securing fabricated spiral stairs to in-place construction; include threaded fasteners for concrete and masonry inserts, through bolts, lag bolts, wood screws, and other connectors as required.
- B. Assemble fabricated spiral stair components to comply with manufacturer's written instructions, with each component aligned and in correct relation to each other, securely anchored to the supporting column and adjacent structure.
- C. Do not cut, alter, or drill stair components in the field that do not fit properly. Return components that do not fit to manufacturer for adjustment.

- D. Install fabricated spiral stairs accurately in location, alignment, and elevation; level and plumb; and according to manufacturer's written instructions.
- E. Install fabricated spiral stairs by welding to steel structure or to weld plates cast into concrete unless otherwise indicated.
- F. Field Welding:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

3.2 CLEANING AND PROTECTION

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint and paint exposed areas with same material.
- B. Protect finished tread surfaces during construction by covering with 1/2-inch thick plywood secured with plastic strapping or another nonmarring fastening method.

END OF SECTION 057113

SECTION 057300 – HANDRAILS AND RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide railings in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:
1. Interior stainless steel railings with stainless steel mesh infill.
 2. Interior stainless steel handrails, at stair locations indicated.
- B. Refer to Division 5 'Section "Fabricated Metal Spiral Stairs" for steel railing assemblies integral to spiral stairs.
- C. Related Sections:
1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
 2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
 3. Division 1 Section "Construction Waste Management".
 4. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
1. Stainless Steel: 60 percent of minimum yield strength.
- C. Structural Performance of Handrails and Railings: Provide handrails and railings capable of withstanding the following structural loads without exceeding allowable design working stress of materials for handrails, railings, anchors, and connections:
1. Top Rail of Guards: Capable of withstanding the following loads applied as indicated:
 - a. Concentrated load of 200 lbf applied at any point and in any direction.
 - b. Uniform load of 50 lbf/ft. applied horizontally and concurrently with uniform load of 100 lbf/ft. applied vertically downward.

- c. Concentrated and uniform loads above need not be assumed to act concurrently.
2. Handrails Not Serving As Top Rails: Capable of withstanding the following loads applied as indicated:
 - a. Concentrated load of 200 lbf applied at any point and in any direction.
 - b. Uniform load of 50 lbf/ft. applied in any direction.
 - c. Concentrated and uniform loads above need not be assumed to act concurrently.
 3. Infill Area of Guards: Capable of withstanding a horizontal concentrated load of 200 lbf applied to 1 sq. ft. at any point in system, intermediate rails, balusters, or other elements composing infill area.
 - a. Load above need not be assumed to act concurrently with loads on top rails in determining stress on guard.
- D. Thermal Movements: Provide handrails and railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:
1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
 2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.
- B. Product Data: Submit manufacturers technical data for manufacturer's product lines of handrails and railings assembled from standard components.
1. Include product data for grout, anchoring cement, and paint products.

- C. Shop Drawings: Show fabrication and installation of handrails and railings. Include plans, elevations, sections, details, and attachments to other Work.
1. For installed handrails and railings indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 2. Submit detailed drawings showing interface between new railing infill and existing to which it will be installed.
 3. Submit details drawn to scale at not less than one inch per foot. Shop drawings shall contain the design, type of material and load assumptions and shall bear the seal of a licensed Professional Engineer registered in the jurisdiction of Project location.
- D. Samples for Verification: For each type of exposed finish required, prepared on components indicated below and of same thickness and metal indicated for the Work. If finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
1. 6-inch-long sections of each different linear railing member, including handrails, top rails, posts, and balusters.
 2. Fittings and brackets.
 3. Welded connections.
 4. Assembled Samples of railings, made from full-size components, including top rail, post, handrail, and infill. Show method of finishing members at intersections. Samples need not be full height.
 5. 12 inch square sample of wire mesh, with all required framing and attachments in size and finish to be used for this Project.
- E. Product Test Reports: Indicating products comply with requirements, based on comprehensive testing of current products.

1.5 QUALITY ASSURANCE

- A. Professional Engineer Qualifications: A professional engineer who is licensed in the State of New York and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of handrails and railings that are similar to those indicated for this Project in material, design, and extent.
- B. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- C. Source Limitations: Obtain each type of railing through one source from a single manufacturer.
- D. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.6, "Structural Welding Code – Stainless Steel."
- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Build mockups as shown on Drawings.
 2. Build mockups for each form and finish of railing consisting of two posts, top rail, infill area, and anchorage system components that are full height and are not less than 24 inches in length.

3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 STORAGE

- A. Store ornamental handrails and railing systems in clean, dry location, away from concrete and masonry, protected against damage. Provide waterproof covering; allow for air circulation inside the covering.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify handrail and railing dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide ornamental handrails and railings as indicated on the Drawings. Provide metal free from pitting, seam marks, roller marks, stains, discolorations, and other imperfections where exposed to view on finished units.
- B. Stainless Steel:
 1. Tubing: ASTM A 554, Grade MT 316.
 2. Pipe: ASTM A 312, Grade TP 316.
 3. Sheet, Strip, Plate, and Flat Bar: ASTM A 666, Type 316.
 4. Bars and Shapes: ASTM A 276, Type 316.
 5. Castings: ASTM A 743, Grade CF 8 or CF 20.
 6. Wire Rope Mesh: Intermediate-crimp, stainless steel wire rope, complying with ASTM A 492, Type 316.
 - a. Pattern: To match Commissioner's sample.
 - b. Wire Rope Construction: 7 by 7.
 - c. Mesh Width: 2 inches, unless otherwise indicated.
- C. Wire Rope/Mesh (Infill Panels): ASTM A 492, Type 316; steel cable/wire, formed into a diamond pattern, woven-wire mesh, of size and diameter as indicated on the Drawings or standard with the selected manufacturer/product.
 1. Available Manufacturers: Subject to compliance with requirements, provide mesh wire rope as manufactured by Jacob Inox, Inc., or one of the following:
 - a. Carl Stahl-DécorCable.
 - b. Approved equal.
 2. Provide steel rods, turnbuckles adjusters, and clevis, fittings indicated for high strength mechanical fastening and adjusting tension for stainless steel cable railings.
- D. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

1. Provide cast brackets with flange tapped for concealed anchorage to threaded hanger bolt.
2. Provide formed or cast brackets with predrilled hole for exposed bolt anchorage.
3. Provide formed metal brackets with predrilled hole for bolted anchorage and with snap-on cover that matches rail finish and conceals bracket base and bolt head.
4. Provide brackets with interlocking pieces that conceal anchorage. Locate set screws on bottom of bracket.

2.2 FASTENERS

- A. Fasteners for Anchoring Handrails and Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring handrails and railings to other types of construction indicated and capable of withstanding design loads.
 1. Stainless-Steel Components: Type 316 stainless-steel fasteners.
- B. Fasteners for Interconnecting Handrail and Railing Components: Use fasteners fabricated from same basic metal as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.
 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other Work, unless otherwise indicated.
- C. Cast-in-Place and Postinstalled Anchors: Anchors of type indicated below, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
 1. Cast-in-place anchors.

2.3 GROUT

- A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for exterior applications.

2.4 FABRICATION

- A. Assemble handrails and railings in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
 1. Fabricate decorative metal railings in profiles, thicknesses, and dimensions to the extent shown on the Drawings.
- B. Form changes in direction of railing members as follows:
 1. As detailed.

- C. Make up mesh/wire rope railing assemblies in the shop to field-measured dimensions with fittings machine swaged. Minimize amount of turnbuckle take-up used for dimensional adjustment so maximum amount is available for tensioning cable railing. Tag cable railing assemblies and fittings to identify installation locations and orientations for coordinated installation.
1. Mesh Infill Panels: Fabricate infill panels from cable or wire rope, woven into diamond mesh pattern, and crimped into steel channel frames.
- D. Wall Mounted Handrails: Provide decorative metal brackets as selected by the Commissioner, fittings, and other hardware as required to permanently secure handrails to custom brackets and brackets to walls.
- E. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain profile of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- F. Welded Connections: Where indicated, fabricate handrails and railings for connecting members by welding. Cope components at perpendicular and skew connections to provide close fit, or use fittings designed for this purpose. Weld connections continuously to comply with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove flux immediately.
 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- G. Mechanical Connections: Where indicated, fabricate handrails and railings by connecting members with railing manufacturer's standard concealed mechanical fasteners and fittings, unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
1. Fabricate splice joints for field connection using epoxy structural adhesive where this is manufacturer's standard splicing method.
- H. Brackets, Flanges, Fittings, and Anchors: Provide scheduled items, or, if not scheduled, manufacturer's standard wall brackets, flanges, miscellaneous fittings, and anchors to connect handrail and railing members to other construction.
- I. Provide inserts and other anchorage devices to connect handrails and railings to concrete. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.
- J. For railing posts set in concrete, provide preset sleeves of steel not less than 6 inches long with inside dimensions not less than 1/2 inch larger than outside dimensions of post, and steel plate forming bottom closure.
- K. For removable railing posts, fabricate slip-fit sockets from steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged

- L. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.
- M. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.
- N. Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.
- O. Provide weep holes or another means to drain entrapped water in hollow sections of railing members that are exposed to exterior or to moisture from condensation or other sources.
- P. Fabricate joints that will be exposed to weather in a watertight manner.
- Q. Close exposed ends of railing members with prefabricated end fittings.

2.5 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
- C. Directional Satin Finish: No. 4.
- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Corrosion Protection: Coat concealed surfaces of metal that will be in contact with grout, concrete, masonry or dissimilar metals, with a heavy coat of bituminous paint.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.2 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.3 ANCHORING POSTS

- A. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Anchor posts to metal surfaces with flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
1. For stainless-steel railings, weld flanges to posts and bolt to metal-supporting surfaces.
- C. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.4 ATTACHING RAILINGS

- A. Anchor railing ends to concrete and masonry with sleeves concealed within railing ends and anchored to wall construction with anchors and bolts.
- B. Attach handrails to walls with wall brackets except where end flanges are used. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.

2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- C. Secure wall brackets and railing end flanges to building construction as follows:
1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 2. For hollow masonry anchorage, use toggle bolts.
- D. Attach wire rope/mesh infill panels to steel framing or posts, as indicated on the Drawings. Use manufacturer's recommended support anchors, bolts, fasteners and nuts.
1. Install all wire rope/mesh and connector assemblies plumb, level, square, and taut.
 2. Terminate and tension wire rope/mesh infill system in accordance with manufacturer's instructions.
 3. Ensure ropes are clean, and without kinks or sags.
 4. After final adjustment provide tamper resistant locktight materials on all fittings.

3.5 CLEANING

- A. Clean stainless steel by washing thoroughly with clean water and soap, rinsing with clean water, and wiping dry.

3.6 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 057300

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SECTION 061000 – ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide carpentry in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Wood grounds, nailers, blocking, and furring and other carpentry work which is generally not exposed.
2. Plywood backing panels for equipment.
3. Plywood sheathing.

B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 SUBMITTALS

A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:

1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.

- B. **Product Data:** For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- C. **Material Certificates:** Submit listing of species and grade selected for framing lumber, and a signed copy of grading rules showing design values for selected lumber. Design values shall comply with specified requirements and approved by the ALSC Board of Review.
- D. **Research/Evaluation Reports:** For the following, showing compliance with building code in effect for Project:
1. Fire-retardant-treated wood.
 2. Power-driven fasteners.
 3. Powder-actuated fasteners.
- E. Research or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence compliance of fire-retardant-treated wood with building code in effect for Project.

1.4 QUALITY ASSURANCE

- A. **Testing Agency Qualifications:** For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.5 DELIVERY, STORAGE AND HANDLING

- A. **Delivery and Storage:** Keep materials under cover and dry. Stack wood to provide air circulation within and around stacks.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. **Lumber:** DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
- B. **Factory mark** each piece of lumber with grade stamp of grading agency.

2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. **General:** Comply with performance requirements in AWPA UCFA (Interior) and AWPA UCFB (Exterior), or as determined by other means during manufacture.

1. Use Exterior type for exterior locations and where indicated.
2. Use Interior type for typical locations, unless otherwise indicated.

B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

C. Application: Treat all rough carpentry, unless otherwise indicated.

2.3 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Cants.
4. Furring.
5. Grounds.
6. Utility shelving.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any species.

C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine, No. 2 grade; SPIB.
2. Eastern softwoods, No. 2 Common grade; NeLMA.
3. Northern species, No. 2 Common grade; NLGA.
4. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.4 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

2.5 PLYWOOD SHEATHING

A. Plywood Wall Sheathing (Interiors): Exterior, Structural I, fire-retardant treated.

1. Span Rating: Not less than 16/0.

B. Nominal Thickness: 3/4 inch, unless otherwise indicated

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Do not splice structural members between supports, unless otherwise indicated.
- C. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- D. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- E. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

3.2 WOOD GROUNDS, NAILERS AND BLOCKING

- A. Provide where shown for screeding or attachment of other work. Shape as shown and locate for true line and level of work to be attached.
- B. Attach to support applied loading. Countersink exposed bolts and nuts flush with surfaces. Where possible, anchor to concrete and masonry during their installation.

- C. Provide permanent grounds of dressed, preservative treated, key-bevelled lumber not less than 1-1/2 inch wide and of thickness to match finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING

- A. Install plumb and level with closure strips at edges and openings. Shim with wood as required for tolerance of finished work.
- B. Provide furring of sizes and spacing as shown on the Drawings.

3.4 INSTALLATION OF CONSTRUCTION PANELS

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Plywood Construction Panels: Screw or nail to supports.
 - 2. Plywood Sheathing: Screw to substrate or supports. Space panels 1/8 inch apart at edges and ends.

3.5 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

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SECTION 064023 – INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide woodwork in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Standing and running trim, to include base.
2. Bamboo cabinets, casework, and countertops, including reception desk.
3. Phenolic resin coated plywood countertops.
4. Solid surfacing counters.
5. Solid surfacing wall and ceiling cladding.
6. Wood veneer panel type paneling/wainscoting.
7. Wood benches.
8. Wood shelving.
9. Cellular pvc paneling.
10. Shop finishing of woodwork.

- B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:
1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
 2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.

4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.
- B. Product Data: Submit product data that verify or are required to ensure compliance with the Contract Documents, to include technical information, shop drawings, samples, calculations, product test reports, etc.
- C. Shop Drawings: Show location of each item of Work, including attachment of panels to theater equipment supplied by other Contractors, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
1. Show details full size.
 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets and other items installed in architectural woodwork.
 4. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
- D. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated below.
1. Shop-applied transparent finishes.
 2. Wood veneer.
 3. Solid-surfacing materials.
- E. Samples for Verification: Submit the following:
1. Lumber, not less than 5 inches wide by 24 inches long, for each species and cut, finished on 1 side and 1 edge.
 2. Bamboo panel products, 8 by 10 inches, for each type, color, pattern, and surface finish.
 3. Wood veneer panel products, 8 by 10 inches, for each type, color, pattern, and surface finish.
 4. Cellular pvc panel products, 8 by 10 inches, for each type, color, pattern, and surface finish.
 5. Phenolic resin coated materials, 6 inches square.
 6. Solid-surfacing materials, 6 inches square.
 7. Corner pieces as follows:
 - a. Cabinet front frame joints between stiles and rail, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
 - b. Miter joints for standing trim.
 8. Exposed cabinet hardware and accessories, one unit for each type and finish.
- F. Product Certificates: Signed by manufacturers of woodwork certifying that products furnished comply with requirements.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production and installation of interior architectural woodwork.
- C. Quality Standard: Comply with AWI's "Architectural Woodwork Quality Standards" for minimum acceptable grades of interior architectural woodwork, construction, finishes, and other requirements.
 - 1. Provide AWI certification labels or compliance certificate indicating that woodwork complies with requirements of grades specified.
- D. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.
- E. Mockups: Before fabricating and installing interior architectural woodwork, build mockups for each form of construction and finish required to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups in the location and of the size indicated or as directed by the Commissioner.
 - 2. Notify the Commissioner seven days in advance of dates and times when mockups will be fabricated and installed.
 - 3. Include mock-ups of existing woodwork to be repair or restored.
 - 4. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 5. Obtain the Commissioner's approval of mockups before starting interior architectural woodwork fabrication.
 - 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 7. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Wood Products: Comply with the following:
 - 1. Hardboard: AHA A135.4.
 - 2. Medium-Density Fiberboard: ANSI A208.2, Grade MD-Exterior Glue.
 - 3. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
- B. Solid Wood: AWI's Section and Grade as indicated, as follows:

1. Species and Finish: Poplar, or as indicated on the Drawings and Material Index.
 2. Solid wood used as trim shall be treated with an organic-resin formulation in accordance with AWWA C 20 unless otherwise indicated.
- C. Veneer Wood: Composite panel products consisting of strands of bamboo, compressed together into a core material, with a bamboo veneer face.
1. Wood Species and Cut for Transparent Finish: Bamboo, or as indicated on the Drawings and Material Schedule.
- D. Phenolic Resin Coated Plywood: Cellulose or hemp-fiber paper heat pressed with phenolic resin; color consistent throughout thickness.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. North American Plywood Corporation.
 - b. Richlite.
 - c. Approved equal.
- E. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with material and performance requirements in ANSI Z124.3, for Type 5 or Type 6, without a precoated finish.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. DuPont Polymers.
 - b. Nevamar.
 - c. Wilsonart.
 - d. Approved equal.
- F. Cellular PVC Panels: Extruded, expanded PVC with a small-cell microstructure, made from UV- and heat-stabilized, rigid material.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Ply-Trim, Inc.
 - b. Royal Mouldings Limited.
 - c. Vycom Corp.; Azek.
 - d. Approved equal.
 2. Density: Not less than 31 lb/cu. ft.
 3. Heat Deflection Temperature: Not less than 130 deg F, per ASTM D 648.
 4. Coefficient of Thermal Expansion: Not more than 4.5×10^{-5} inches/inch x deg F.
 5. Water Absorption: Not more than 1 percent, per ASTM D 570.
 6. Flame-Spread Index: 75 or less, per ASTM E 84.

2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Comply with performance requirements of AWPA C20 (lumber) and AWPA C27 (plywood). Use Exterior Type or Interior Type A. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Kiln-dry material after treatment.
- B. Fire-Retardant Particleboard: Panels made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture with flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.
- C. Fire-Retardant Fiberboard: ANSI A208.2 medium-density fiberboard panels made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture with flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.

2.3 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.
- B. Hardware Standard: Comply with BHMA A156.9 for items indicated by referencing BHMA numbers or items referenced to this standard.
- C. Butt Hinges: BHMA A156.9; 5-knuckle steel hinges made from 0.095-inch-thick metal, and as follows:
 - 1. Semiconcealed Hinges for Flush Doors: BHMA A156.9, B01361.
- D. Back-Mounted Pulls: BHMA A156.9, B02011.
- E. Wire Pulls: Back mounted, stainless steel, 4 inches long.
- F. Catches: Provide manufacturer's standard adjustable roller-type catches.
- G. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081; with shelf brackets, B04112.
- H. Shelf Rests: BHMA A156.9, B04013.
- I. Drawer Slides: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, BHMA A156.9, B05091, and rated for the following loads:
 - 1. Box Drawer Slides: 100 lbf.
 - 2. File Drawer Slides: 200 lbf.
 - 3. Pencil Drawer Slides: 45 lbf.
 - 4. Keyboard Slide: 75 lbf.
 - 5. Trash Bin Slides: 150 lbf.
- J. Door and Drawer Locks: RFID programmable keyless locks, with touchpad combination locking.
 - 1. Available Manufacturers: Provide products by one of the following:
 - a. StealthLock/Hafele.

- b. Keyless Lock Store (distributor).
 - c. Approved equal.
- K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
- 1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
 - 2. Bright Chromium Plated: BHMA 625 for brass or bronze base; BHMA 651 for steel base.
 - 3. Satin Stainless Steel: BHMA 630.
- L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 INSTALLATION MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln-dried to less than 15 percent moisture content; where integral with cabinetry, provide lumber kiln-dried to less than 10 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.5 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Specified AWI quality standards for interior woodwork shall serve as minimum acceptable standards. Modifications and additions to specified standards, e.g. additional finish coats or stain, may be necessary to achieve acceptable matches with the Commissioner's control samples.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
- 1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: 1/16 inch.
- D. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- E. Shop cut openings, to maximum extent possible, to receive hardware including acoustical seals, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
- 1. Seal edges of openings in countertops with a coat of varnish.

2.6 STANDING AND RUNNING TRIM

- A. General: Provide standing and running trim including, but not limited to base trim, window head and jamb trim, window subsill and door sill casings, shoes, custom framing units, and any other miscellaneous trimwork, to the extent detailed on the Drawings.
- B. Grade: Premium.
- C. Wood Species: Poplar.
- D. Sizes, Profiles, Cut, and Finish: As indicated on the Drawings and Material Schedule.
 - 1. Cut from solid lumber members.
- E. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.
- F. Assemble casings in plant except where limitations of access to place of installation require field assembly.

2.7 WOOD CABINETS AND CASEWORK FOR TRANSPARENT FINISH

- A. Quality Standard: Comply with AWI Section 10 requirements for wood cabinets.
- B. Grade: Premium.
- C. AWI Type of Cabinet Construction: Flush Panel, as per requirements of AWI 10.
- D. Wood Species: Bamboo; as indicated on the Drawings and Material Schedule.
 - 1. Basis of Design: Provide Carmelized Bamboo, by Teragren, or approved equal.
 - 2. Grain Matching: Run and match grain vertically for drawer fronts, doors, and fixed panels.
 - 3. Matching of Veneer Leaves: Book match.
 - 4. Vertical Matching of Veneer Leaves: End match.
 - 5. Veneer Matching within Panel Face: Center match.
 - 6. Veneer Matching within Room: Provide cabinet veneers in each room or other space from a single flitch with doors, drawer fronts, and other surfaces matched in a sequenced set with continuous match where veneers are interrupted perpendicular to the grain.
 - 7. Comply with veneer and other matching requirements indicated for blueprint-matched paneling.
- E. Semiexposed Surfaces: Provide surface materials indicated below:
 - 1. Surfaces Other Than Drawer Bodies: Compatible species to that indicated for exposed surfaces, stained to match.
- F. Provide custom fabricated assemblies as indicated on the drawings and approved shop drawings. Built-in units and any other miscellaneous casework or millwork assemblies shall meet the minimum performance requirements per the referenced standard, and premium quality/professional craftsmanship.

2.8 PHENOLIC RESIN COATED PLYWOOD COUNTERTOPS

- A. Quality Standard: Comply with AWI Section 11 requirements for wood cabinets.
 - 1. AWI Type of Cabinet Construction: Flush overlay or as indicated. Provide butt joints between adjacent panels and construction.
 - 2. Reveal Dimension: 1/2 inch, or as indicated.
 - 3. Exposed, Semiexposed, and Concealed Surfaces: Composite phenolic resin paper veneer facing.
 - 4. Edges: Exposed plywood.
- B. Basis of Design Product: Provide 1 inch Resin Countertop, by Richlite, or approved equal.
 - 1. Colors, Patterns, and Finishes: As selected by Commissioner from resin coated plywood manufacturer's full range of colors.

2.9 SOLID-SURFACING-MATERIAL COUNTERS

- A. Quality Standard: Comply with AWI Section 11 requirements for countertops.
 - 1. Grade: Premium.
- B. Basis of Design Product: Provide Corian, by DuPont Polymers, or approved equal.
 - 1. Solid-Surfacing-Material Thickness: 1/2 inch, unless otherwise indicated.
- C. Colors, Patterns, and Finishes: As selected by the Commissioner.
- D. Fabricate tops in one piece with shop-applied backsplashes and edges, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
- E. Install integral sink bowls in countertops in shop.
- F. Drill holes in countertops for plumbing fittings and soap dispensers in shop.
- G. Custom Fabrications: Fabricate in 1" thick panel sheets, of sizes as indicated on the Drawings, for application to desk, wall, and ceiling substrates. Finish edges smooth and to the extent as detailed on the Drawings, or as recommended by manufacturer for the use intended.
 - 1. Provide shims/spacers as required and in accordance with the fabricator's recommendations.
- H. On site seaming shall be done as indicated on the Drawings to provide a continuous solid appearance.

2.10 WOOD PANELS FOR TRANSPARENT FINISH

- A. Quality Standard: Comply with AWI Sections 200 and 500 requirements for wood panels and paneling.
- B. Species: Walnut.

- C. Sizes and Profiles: As indicated on the Drawings; complying with AWI standards.
- D. Matching of Adjacent Veneer Leaves: Book matched, unless otherwise indicated.
- E. Veneer Matching within Panel Face: Balance matched, unless otherwise indicated.
- F. Veneer Matching within Room: Provide veneers in each room or other space from a single flitch with panels, doors, drawer fronts, and other surfaces matched in a sequenced set with continuous match where veneers are interrupted perpendicular to the grain.

2.11 CELLULAR PVC PANELS

- A. General: Wall panels fabricated from extruded, expanded PVC with a small-cell microstructure, made from UV- and heat-stabilized, rigid material. Provide panels of thickness and sizes as indicated on the Drawings.
 - 1. Finish: Provide finishes to match approved samples.
- B. Fabricate units straight, smooth, and true to size and shape, and within the specified fabrication tolerances, with exposed edges and corners square. Cellular pvc fabrications which are cracked, stained, or otherwise defective will not be acceptable.
- C. Fasteners:
 - 1. Use fasteners fabricated from stainless steel or hot-dipped galvanized designed for wood trim / paneling (thinner shank, blunt point, full round head) with architectural plastic assemblies.
 - 2. Staples, small brads and wire nails must not be used as fastening members.
- D. Adhesives:
 - 1. Glue all pvc to pvc joints with manufacturer's recommended adhesive to prevent joint separation.
 - 2. Secure adhesive joint with a fastener and/or fasten on each side of the joint to allow adequate bonding time.
- E. Sealants: Use urethane, polyurethane or acrylic based sealants without silicone.
- F. Provide all anchors, clips, studs, bolts, inserts, and other devices required for handling and installing the cellular pvc panels and for the attachment of subsequent items as indicated or specified.

2.12 WOOD BENCHES

- A. Exposed Lumber: Provide material hand selected for freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot holes, shake, splits, torn grain, and wane.
- B. Wood Benches: Fabricate from standard lumber profiles and shapes composed of the following:
 - 1. Species and Cut: as selected by the Commissioner.
 - 2. Grade: Premium.
 - 3. Bench Configuration and Size: As indicated on the Drawings.
 - 4. Surface Texture: Smooth, wood grain.

5. Finish: Exterior transparent (clear) finish, matching approved samples.
- C. Complete fabrication, assembly, finishing, related framing and metalwork, and other work before shipment to the Project site, to the maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- 2.13 SHELVING
- A. Utility Shelving: Made from any closed grain hardware to receive painted finish; 3/4 inch thick.
 - B. Shelf Brackets: BHMA A156.16, B04041; prime-painted formed steel.
 - C. Standards for Adjustable Shelf Brackets: BHMA A156.9, B04102; powder-coat-finished steel.
 - D. Adjustable Shelf Brackets: BHMA A156.9, B04112; powder-coat-finished steel.
- 2.14 SHOP FINISHING
- A. Quality Standard: Comply with AWI Section 1500.
 1. Provide low-VOC finish coatings, meeting requirements of authorities having jurisdiction for the location of the Project.
 - B. Preparations for Finishing: Comply with referenced quality standard for sanding, filling counter-sunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces.
 - C. Opaque Finish:
 1. Grade: Premium.
 2. AWI Finish System: Acrylic lacquer.
 3. Color: Match approved sample for color.
 4. Sheen: As indicated on the Drawings and Material Schedule.
 - D. Transparent Finish:
 1. Grade: Premium.
 2. AWI Finish System: Acrylic lacquer.
 3. Staining: Match approved sample for color.
 4. Wash Coat for Stained Finish: Apply a wash-coat sealer to woodwork made from closed-grain wood before staining and finishing.
 5. Open-Grain Woods: Do not apply filler to open-grain woods.
 6. Sheen: As indicated on the Drawings and Material Schedule.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.
- B. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.
- C. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- D. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Scarf running joints and stagger in adjacent and related members.
 - 1. Fill gaps, if any, between top of base and window or wall with wood filler, sand smooth, and finish same as wood base if finished.
- E. Cabinets and Casework: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items.
- F. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop.
- G. Paneling: Anchor to supporting substrate with concealed panel-hanger clips, unless otherwise indicated. Do not use face fastening, unless otherwise indicated.
 - 1. Install flush paneling with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane.
- H. Cladding/Paneling: Secure solid surfacing wall and ceiling cladding to substrates indicated using full spread of silicone adhesive as recommended by solid surface manufacturer. Install level and plumb. Where indicated or required by manufacturer for ceiling applications, provide panels with predrilled holes for screw fastened installation. Provide fasteners of type and size as required to secure to substrate and support panels without deflection.

3.2 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.

- C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064023

SECTION 078123 - INTERIOR INTUMESCENT FIREPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide intumescent fireproofing in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Exposed intumescent mastic fire-resistive coatings for interior structural steel columns and beams.

- B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction Waste Management".
4. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:

1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.

- B. **Product Data:** For each type of product indicated, include manufacturer's technical information, performance requirements, and installation instructions.
- C. **Shop Drawings:** Structural framing plans indicating the following:
 - 1. Locations and types of surface preparations required before applying SFRM.
 - 2. Extent of SFRM for each construction and fire-resistance rating, including the following:
 - a. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1) For steel joist assemblies, include applicable fire-resistance design designations, with each steel joist tested with the same maximum tensile stress as each steel joist indicated on Drawings. Design designations with steel joists tested at lower maximum tensile stress than those indicated are not permitted.
 - b. Minimum thicknesses needed to achieve required fire-resistance ratings of structural components and assemblies.
 - 3. Treatment of SFRM after application.
- D. **Samples for Initial Selection:** For each type of colored, exposed SFRM indicated.
- E. **Samples for Verification:** For each type of colored, exposed SFRM, two Samples, each 4 inches square, of each color, texture, and material formulation to be applied. Where finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
- F. **Product Certificates:** For each type of SFRM, signed by product manufacturer.
- G. **Qualification Data:** For Installer, manufacturer, professional engineer, and testing agency.
- H. **Compatibility and Adhesion Test Reports:** From SFRM manufacturer indicating the following:
 - 1. Materials have been tested for bond with substrates.
 - 2. Materials have been verified by SFRM manufacturer to be compatible with substrate primers and coatings.
 - 3. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- I. **Product Test Reports:** Based on evaluation of comprehensive tests performed by a qualified testing agency, for proposed SFRM.
- J. **Research/Evaluation Reports:** For SFRM.
- K. **Special Inspection Reports:** Prepare and submit Special Inspection reports/forms required by Code and file report with NYC Department of Buildings.
- L. **Warranties:** Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. **Installer Qualifications:** Engage an experienced Installer who has completed SFRM applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance. A manufacturer's willingness to sell its SFRM to an installer does not in itself confer qualification on the buyer.
- B. **Source Limitations:** Obtain SFRM through one source from a single manufacturer.
- C. **SFRM Testing:** By a qualified testing and inspecting agency employed and paid by City of New York to test for compliance with specified requirements for performance and test methods.
1. SFRMs are randomly selected for testing from bags bearing the applicable classification marking of UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 2. Testing is performed on specimens of SFRMs that comply with laboratory testing requirements specified in Part 2 and are otherwise identical to installed fire-resistive materials, including application of accelerant, sealers, topcoats, tamping, troweling, rolling, and water overspray, if any of these are used in final application.
- D. **Compatibility and Adhesion Testing:** Engage a qualified testing and inspecting agency to test for compliance with requirements for specified performance and test methods.
1. Test for bond per ASTM E 736 and requirements in UL's "Fire Resistance Directory" for coating materials. Provide bond strength indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
 2. Verify that manufacturer, through its own laboratory testing or field experience, has not found primers or coatings to be incompatible with SFRM.
- E. **Fire-Test-Response Characteristics:** Provide SFRM with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify bags containing SFRM with appropriate markings of applicable testing and inspecting agency.
1. **Fire-Resistance Ratings:** Indicated by design designations from UL's "Fire Resistance Directory" acceptable to authorities having jurisdiction, for SFRM serving as direct-applied protection tested per ASTM E 119.
 2. **Surface-Burning Characteristics:** ASTM E 84.
- F. **UL Designations:** Specific UL assemblies integral to the work specified in this Section shall be indicated on the Drawings, unless otherwise indicated.
- G. Provide products containing no detectable asbestos as determined according to the method specified in 40 CFR 763, Subpart E, Appendix E, Section 1, "Polarized Light Microscopy."
- H. **Mockups:** Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. **Extent of Mockups:** Approximately 100 sq. ft. of surface for each product indicated.
 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to Project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, shelf life if applicable, and fire-resistance ratings applicable to Project.
- B. Use materials with limited shelf life within period indicated. Remove from Project site and discard materials whose shelf life has expired.
- C. Store materials inside, under cover, and aboveground; keep dry until ready for use. Remove from Project site and discard wet or deteriorated materials.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply SFRM when ambient or substrate temperature is 40 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.
- B. Ventilation: Ventilate building spaces during and after application of SFRM. Use natural means or, if they are inadequate, forced-air circulation until fire-resistive material dries thoroughly.

1.7 COORDINATION

- A. Sequence and coordinate application of SFRM with other related work specified in other Sections to comply with the following requirements:
 - 1. Provide temporary enclosure as required to confine spraying operations and protect the environment.
 - 2. Provide temporary enclosures for applications to prevent deterioration of fire-resistive material due to exposure to weather and to unfavorable ambient conditions for humidity, temperature, and ventilation.
 - 3. Avoid unnecessary exposure of fire-resistive material to abrasion and other damage likely to occur during construction operations subsequent to its application.
 - 4. Defer installing ducts, piping, and other items that would interfere with applying fire-resistive material until application of fire protection is completed.
 - 5. Do not install enclosing or concealing construction until after fire-resistive material has been applied, inspected, and tested and corrections have been made to defective applications.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form, signed by Contractor and by Installer, in which manufacturer agrees to repair or replace SFRMs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Cracking, flaking, spalling, or eroding in excess of specified requirements; peeling; or delaminating of SFRM from substrates.
 - b. Not covered under the warranty are failures due to damage by occupants and City of New York's maintenance personnel, exposure to environmental conditions other than those investigated and approved during fire-response testing, and other causes not reasonably foreseeable under conditions of normal use.
 - 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EXPOSED INTUMESCENT MASTIC FIRE-RESISTIVE COATINGS

- A. Basis of Design: Subject to compliance with requirements, provide intumescent fireproof coatings as manufactured by one of the following:
1. A/D Fire Protection Systems Inc.
 2. Albi Manufacturing, Division of StanChem Inc.
 3. Carbolite Company, Fireproofing Products Div.
 4. Isolatek International Corp.
 5. Approved equal.
- B. Fire-Resistive, Intumescent Mastic Coating: Factory-mixed formulation.
1. Water-Based Formulation: Approved by manufacturer and authorities having jurisdiction and tested in accordance with UL 263 (ASTM E 119).
 2. Thin-film mastic coating consisting of intumescent base coat, to receive separate topcoat.
- C. Primers: For use on each steel substrate and with each sprayed fire-resistive product, provide primer as recommended by the manufacturer specifically for use with above specified intumescent coating.
1. Performance Requirements: Provide primer to comply with one or both of the following:
 - a. Primer's bond strength complies with requirements specified in UL's "Fire Resistance Directory" for coating materials based on a series of bond tests per ASTM E 736.
 - b. Primer is identical to those used in assemblies tested for fire-test-response characteristics of SFRM tested per UL 263 (ASTM E 119) or another testing and inspecting agency acceptable to authorities having jurisdiction.
- D. Topcoat: High quality semigloss acrylic latex; type recommended in writing by manufacturer of each SFRM for application over exposed SFRM.
1. Color and Gloss: As selected by Commissioner from manufacturer's full range.

2.2 AUXILIARY FIRE-RESISTIVE MATERIALS

- A. General: Provide auxiliary fire-resistive materials that are compatible with SFRM and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of work. A substrate is in satisfactory condition if it complies with the following:
1. Substrates comply with requirements in the Section where the substrate and related materials and construction are specified.

2. Substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, incompatible paints, incompatible encapsulants, or other foreign substances capable of impairing bond of fire-resistive materials with substrates under conditions of normal use or fire exposure.
 3. Objects penetrating fire-resistive material, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
 4. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying fire-resistive material.
- B. Conduct tests according to fire-resistive material manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fire-resistive materials during application.
- B. Clean substrates of substances that could impair bond of fire-resistive material, including dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, and incompatible primers, paints, and encapsulants.
- C. Prime substrates where recommended in writing by SFRM manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive SFRM.
- D. For exposed applications, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of SFRM. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

- A. Comply with fire-resistive material manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and spray on fire-resistive material, as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- B. Apply SFRM that is identical to products tested as specified in Part 1 "Quality Assurance" Article and substantiated by test reports, with respect to rate of application, accelerator use, sealers, topcoats, or other materials and procedures affecting test results.
- C. Extend fire-resistive material in full thickness over entire area of each substrate to be protected. Unless otherwise recommended in writing by SFRM manufacturer, install body of fire-resistive covering in a single course.
- D. Spray apply fire-resistive materials to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by SFRM manufacturer, and producing surface texture approved by the Commissioner.
- E. Apply exposed intumescent mastic fire-resistive coatings in thicknesses and densities not less than those required to achieve fire-resistance ratings designated for each condition. Comply with each manufacturer's recommendations.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Inspecting agency employed and paid by City of New York shall examine completed intumescent fireproofing to determine, in general, if it is being installed in compliance with requirements.
 - 1. Intumescent fireproofing is subject to special inspection in accordance with the New York City Building Code.
- B. Tests and Inspections: Testing and inspecting of completed applications of SFRM shall take place in successive stages, in areas of extent and using methods as indicated by reference standards. Do not proceed with application of SFRM for the next area until test results for previously completed applications of SFRM show compliance with requirements. Tested values must equal or exceed values indicated and required for approved fire-resistance design.
- C. Remove and replace applications of SFRM that do not pass tests and inspections for cohesion and adhesion, for density, or for both and retest as specified above.
- D. Apply additional SFRM, per manufacturer's written instructions, where test results indicate that thickness does not comply with specified requirements, and retest as specified above.

3.5 CLEANING, PROTECTING, AND REPAIR

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect SFRM, according to advice of product manufacturer and Installer, from damage resulting from construction operations or other causes so fire protection will be without damage or deterioration at time of Substantial Completion.
- C. Coordinate application of SFRM with other construction to minimize need to cut or remove fire protection. As installation of other construction proceeds, inspect SFRM and patch any damaged or removed areas.
- D. Repair or replace work that has not successfully protected steel.

END OF SECTION 078123

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SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide firestopping in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Penetrations through fire-resistance-rated floors, walls, and partitions.
2. Penetrations through smoke barriers.
3. Sealant joints in fire-resistance-rated construction.
4. Furnishing of dams, clips and closures for support and containment of fire stopping materials and installation of dams, clips and closures where possible to install after completion of floors, walls or other construction.

- B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. General: For the following constructions, provide firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly penetrated.
1. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.
 2. Fire-resistance-rated floor assemblies, including slab perimeter and floor edge conditions.
- B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
1. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls and fire partitions.
 2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

- C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
1. Horizontal assemblies include floor and ceiling assemblies.
 2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
 3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.
- E. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.
- F. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- G. Jointed Systems: Provide joint firestop systems indicated, as determined per ASTM E 1399, but not less than that equaling or exceeding fire-resistance rating of adjoining construction.
- H. For firestop systems exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.
1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved either by installing floor plates or by other means.
 3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- I. Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the Architect prior to penetrating any load bearing assembly.
- J. Where subject to movement, firestopping materials used shall remain flexible and allow for normal movement of building structure, substrates, penetrating items and related surfaces and items without affecting integrity and performance of firestopping materials and systems.

1.4 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:
1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
 2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.

3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.
- B. Product Data: For each type of product specified, provide manufacturers technical data, material safety data sheets (MSDS), performance requirements and installation instructions.
1. Submit manufacturers documentation indicating products used are approved for use in the City of New York.
- C. Shop drawings detailing materials, installation methods, and relationships to adjoining construction for each through-penetration firestop system, and each kind of construction condition penetrated and kind of penetrating item. Include firestop design designation of qualified testing and inspecting agency evidencing compliance with requirements for each condition indicated.
1. List of Conditions: Shop Drawings shall list all firestopping categories indicated or expected for the project. For each type of construction element and assembly indicated, list the UL Design Number to be complied with, include coordinated specified product data for each product incorporated into firestopping assemblies. Attach a copy of each UL Design Number listed.
 2. For unusual penetrations which have no formal tested assembly and which require modification of qualified testing and inspecting agency's illustration to suit the particular unusual through-penetration firestop condition, submit Drawings and product data and associated illustrations prepared by qualified firestopping Manufacturer's Fire Protection Engineer including required modifications clearly illustrated.
 - a. Manufacturer's engineering judgment shall be derived from similar UL system designs or other applicable tests. Engineer judgment drawings must follow requirements set forth by the International Firestop Council.
 3. The Manufacturer issuing the engineering judgment shall be responsible for issued engineering judgments without any adjustment to the responsibilities of the entities involved.
- D. Certificates:
1. From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.
 2. Product certificates signed by manufacturers of firestopping products certifying that their products comply with specified requirements.
 - a. Submit certification by firestopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.

- E. Special Inspection Reports: Prepare and submit Special Inspection reports/forms required by Code and file report with NYC Department of Buildings.
- F. Product test reports from, and based on tests performed by, a qualified testing and inspecting agency evidencing compliance of firestopping with requirements based on comprehensive testing of current products.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.
- B. Single-Source Responsibility: Obtain all firestopping systems for each kind of penetration, joint and construction condition indicated from a single manufacturer.
- C. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
 - 1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
 - b. Classification markings on penetration firestopping correspond to designations listed by the following:
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek ETL SEMKO in its "Directory of Listed Building Products."
 - 3) FM Global in its "Building Materials Approval Guide."
- D. Field-Constructed Mockup: Prior to installing firestopping, erect mockups for each different through-penetration firestop system indicated to verify selections made and to demonstrate qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final installations.
 - 1. Locate mockups on site in locations indicated or, if not indicated, as directed by the Commissioner.
 - 2. Notify directed by the Commissioner one week in advance of the dates and times when mockups will be erected.
 - 3. Obtain directed by the Commissioner's acceptance of mockups before start of final unit of Work.
 - 4. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging completed unit of Work.
 - a. Accepted mockups in an undisturbed condition at time of Substantial Completion may become part of completed unit of Work.

- E. Provide firestopping products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy."
- F. Preinstallation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.
- C. Notify City of New York's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. A/D Fire Protection Systems Inc.
 - 2. Grace Construction Products.
 - 3. Hilti, Inc.
 - 4. Specified Technologies Inc.
 - 5. 3M Fire Protection Products.
 - 6. Tremco, Inc.; Tremco Fire Protection Systems Group.

2.2 PENETRATION FIRESTOPPING

- A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
 - 1. Permanent forming/damming/backing materials, including the following:

- a. Slag-wool-fiber or rock-wool-fiber insulation.
 - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - c. Fire-rated form board.
 - d. Fillers for sealants.
2. Temporary forming materials.
 3. Substrate primers.
 4. Collars.
 5. Steel sleeves.

2.3 FILL MATERIALS

- A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.
- E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
- I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.4 MIXING

- A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 PENETRATION FIRESTOPPING

- A. General: Comply with the "System Performance Requirements" article in Part 1 and the firestopping manufacturer's installation instructions and drawings pertaining to products and applications indicated.
 - 1. The Contractor shall select the material and UL test assemblies to be used as may be required for each type of material, location, rating and penetration or hole size. Do not proceed with the work until all submittals have been fully approved.
 - 2. Provide firestopping materials and thicknesses as required to provide indicated ratings. Where not otherwise indicated, comply with U.L. standard designs. In multiple layer work, offset joints by at least 6 inches.
 - 3. Install firestopping without gaps and voids of any kind. Do not use damaged materials. Remove and replace nonfitting or disturbed work. Do not use fire safing materials containing solvents.

- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.
- C. Install fill materials for firestopping by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.
 - 4. Provide 20 gauge minimum metal plates where required for fire safing support to comply with fire rating.
 - 5. For mineral safing insulation, apply in continuous length using manufacturer's standard safing clips compress insulation until stable without movement.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Inspecting agency employed and paid by City of New York shall examine completed intumescent fireproofing to determine, in general, if it is being installed in compliance with requirements.
 - 1. Intumescent fireproofing is subject to special inspection in accordance with the New York City Building Code.
- B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.
- C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.5 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

END OF SECTION 078413

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide sealants in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:
1. Interior and exterior joint sealants and backings in horizontal and vertical surfaces, as indicated and required.
 2. Primers, bond breakers, backer rods, joint fillers, and other accessory materials for interior and exterior joints.
- B. Related Sections:
1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
 2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
 3. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.
- B. Sealants used as weather seals shall not experience adhesive or cohesive failure. Sealants shall withstand movements up to the limits prescribed by the manufacturer. Exposed sealant surface shall not crack or bubble. Sealants and primers shall not stain adjacent materials. Sealants shall not be adhered to, or placed against, the edge of a laminated glass unit interlayer.

1.4 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:
1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
 2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.

3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.
- B. Product Data: Submit manufacturer's technical data for each product required, including instructions for preparation and application.
- C. Samples:
1. Submit samples for initial selection purposes in form of manufacturer's standard bead samples, consisting of strips of actual products showing full range of manufacturer's standard colors available, for each product exposed to view.
 2. Submit samples for verification purposes of each type and color of joint sealant required. Install joint sealant samples in 1/2-inch wide joints formed between two 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Certificates: Submit certificates from manufacturers that their products comply with specifications and are suitable for the use indicated.
- E. Test Reports: Submit joint sealer-substrate test results to verify compatibility of proposed joint sealants with substrates. Manufacturer shall conduct tests and provide reports complying with the following:
1. Compatibility and adhesion test reports from elastomeric sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.
 2. Preconstruction field test reports indicating which products and joint preparation methods demonstrate acceptable adhesion to joint substrates.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.
- B. Testing Laboratory Qualifications: To qualify for acceptance, an independent testing laboratory must demonstrate to Commissioner's satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct satisfactorily the testing indicated without delaying progress of the Work.
- C. Single Source Responsibility for Joint Sealant Materials: Obtain each different primary joint sealant materials required from a single manufacturer; obtain auxiliary/secondary materials as recommended by, and acceptable to, the prime materials manufacturer.
- D. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
- E. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.
- F. Preconstruction Field Testing: Prior to installation of joint sealants, field-test their adhesion to joint substrates as follows:
1. Locate test joints where indicated or, if not indicated, as directed by the Commissioner.
 2. Conduct field tests for each application indicated within this section.
 3. Notify Commissioner one week in advance of the dates and times when mock-ups will be erected.
 4. Arrange for tests to take place with joint sealant manufacturer's technical representative present.
 5. Test Method: Test joint sealants by hand pull method described below:
 - a. Install joint sealants in 60 inches joint lengths using same materials and methods for joint preparation and joint sealant installation required for completed Work. Allow sealants to cure fully before testing.
 - b. Make knife cuts horizontally from one side of joint to the other followed by 2 vertical cuts approximately 2 inches long at side of joint and meeting horizontal cut at top of 2-inch cuts. Place a mark 1 inch from top of 2-inch piece.
 - c. Use fingers to grasp 2" piece of sealant just above 1-inch mark; pull firmly down at a 90-degree angle or more while holding a ruler along side of sealant. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.
 6. Report whether or not sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.
 7. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.
- G. Stainability Tests: Prior to installation of joint sealants, field-test sample applications of sealant on stone and other porous substrate samples of types of substrates to be used in the Project to test stainability of substrates by sealants proposed to be use in the finished work. Submit test samples for evaluation.
- H. Field-Constructed Mock-Ups: Prior to installation of joint sealants, apply elastomeric sealants as follows to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution:
1. Joints in field-constructed mock-ups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants specified in this Section.

- I. Pre-Installation Conference: Before beginning the sealant installation, conduct a preinstallation conference at a location determined by the Commissioner with the sealant manufacturer(s), installer, aluminum system manufacturer's representative, masonry manufacturer and other interested parties to review procedures, schedules, and coordination of the sealant with other elements of the Work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.
- B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Conditions: Do not install joint sealers when air and surface temperatures are outside the limits permitted by joint sealer manufacturer, or when joint substrates are wet or dirty.
- B. Joint Widths: Do not proceed with installation of joint sealers when joint widths are not as allowed by joint sealer manufacturer.

1.8 WARRANTY

- A. Submit a written warranty agreeing to repair or replace defective joint sealer materials or workmanship; including staining, loss of adhesion, loss of cohesion, cracking or discoloration, for a period of 5 years from the date of Substantial Completion.
- B. The warranty should include a provision that the period of such warranty shall commence with the City of New York's final acceptance of all work covered under the Contract or at such other date or dates as the City of New York may specify in writing prior to that time.
- C. The following types of failure will be adjudged as defective work:
 1. Abnormal deterioration, aging or weathering of the work.
 2. Water leakage under conditions equivalent to, or less severe than, those specified.
 3. Air leakage exceeding specified limits.
 4. Sealant loss of adhesion, loss of cohesion, cracking or discoloration.
 5. Staining of sealed substrates by sealant or primer.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. Colors: Provide colors of joint sealers as selected by the Commissioner, from manufacturer's standard colors.

2.2 ELASTOMERIC JOINT SEALANTS

- A. **Elastomeric Sealant Standard:** Provide manufacturer's standard chemically curing elastomeric sealants that comply with ASTM C 920 and other requirements indicated including those requirements referencing classifications of ASTM C 920 for Type, Grade, Class, and Uses.
- B. **Single-component, Neutral Curing Silicone Sealant:** Type S; Grade NS; Class 50:
1. **Uses:** For all joints except as otherwise indicated in this Section.
 2. **Additional Capability:** When tested per ASTM C 719, to withstand 50 percent increase and decrease of joint width.
 3. **Products:** Subject to compliance with requirements, provide one of the following, or approved equal:
 - a. "Dow Corning 791/795"; Dow Corning Corp.
 - b. "Silpruf"; General Electric Co.
 - c. "Pecora 865/895"; Pecora Corporation.
- C. **One-Part Mildew-Resistant Silicone Sealant:** Type S; Grade NS; Class 25.
1. **Uses:** Non-traffic, formulated with fungicide for sealing interior joints with nonporous substrates at vertical surfaces of tile in toilets and between plumbing fixtures and tile.
 2. **Products:** Subject to compliance with requirements, provide one of the following, or approved equal.
 - a. "786 Mildew Resistant"; Dow Corning Corporation.
 - b. "Sanitary SCS1700"; GE Silicones.
 - c. "Tremsil 200 (White)"; Tremco.
- D. **Single-Component, Pourable, Traffic-Grade, Urethane Joint Sealant:** ASTM C 920, Type S, Grade P, Class 25, for Use T.
1. **Uses:** Traffic, for floor joints.
 2. **Available Products:** Subject to compliance with requirements, provide one of the following, or approved equal:
 - a. "Sonolastic SL 1"; BASF Building Systems.
 - b. "Urexpan NR-201"; Pecora Corporation.
 - c. "Vulkem 45"; Tremco Incorporated.

2.3 LATEX JOINT SEALANTS

- A. **Acrylic-Emulsion Sealant:** One part, nonsag sealant complying with ASTM C 834, paintable and recommended for interior applications with joint movement of not more than plus or minus 5 percent.
1. **Products:** Subject to compliance with requirements, provide one of the following, or approved equal:
 - a. "Chem-Calk 600"; Bostik Construction Products Div.
 - b. "AC-20"; Pecora Corp.
 - c. "Tremco Acrylic Latex 834"; Tremco Inc.

2.4 MISCELLANEOUS JOINT SEALANTS

- A. Butyl-Polyisobutylene Sealant: Manufacturer's standard, solvent- release-curing, butyl-polyisobutylene sealant complying with AAMA 809.2, for concealed metal to metal joints.
- B. Fire-resistant Joint Sealants, General: Refer to Division 7 Section "Penetration Firestopping", for materials and requirements.
 - 1. Provide sealant with fire-resistance rating identical to assemblies tested per ASTM E 814 by Underwriters Laboratory, Inc. or other testing agency acceptable to authorities.
 - 2. Fire-Stopping Sealant: One or two-part, foamed-in-place, silicone sealant for filling or sealing openings around cables, conduit, pipes and similar penetrations through walls and floors.
- C. Acoustical Joint Sealants, General: Provide sealants that comply with the requirements specified herein and as specified in Division 9 Section "Gypsum Board".
 - 1. Concealed Acoustical Sealant: ASTM C 834, nonhardening, non-skinning, nonstaining, non-bleeding, gunnable sealant for concealed applications per ASTM C 919.
 - 2. Exposed Acoustical Sealant: Nonoxidizing, skinnable, paintable, gunnable smoke sealant for exposed applications per ASTM C 919.

2.5 COMPRESSION SEALS AND JOINT FILLERS

- A. Preformed Foam Sealant: Precompressed, open-cell foam sealant of high-density urethane foam with a nondrying, water repellent agent; precompressed to develop a watertight and airtight seal.
 - 1. Properties: Permanently elastic, mildew-resistant, non-migratory, nonstaining, compatible with joint substrates and other sealers.
 - 2. Products: Subject to compliance with requirements, provide one of the following, or approved equal; of size to suit joint dimensions:
 - a. "Emseal Greyflex"; Emseal Corp.
 - b. "Will-Seal Tape Type 150"; Illbruck.
 - c. Approved equal.
- B. Joint Filler for Paving: Preformed strips of sponge rubber complying with ASTM D 1752, of size and shapes as shown.
- C. Plastic Foam Joint-Fillers: Preformed, compressible, resilient, non-waxing, non-extruding strips of plastic foam of material indicated below, and of size, shape and density to control sealant depth.
 - 1. Flexible, non-gassing, closed-cell polyethylene foam, unless otherwise indicated.
 - a. Provide color as selected by the Commissioner from the manufacturer's full range of colors.
- D. Tubing Joint-Fillers: Neoprene, EPDM or silicone tubing complying with ASTM D 1056, non-absorbent to water and gas, resilient at temperatures down to -26 deg F., of size and shape to provide a secondary seal.

- E. Back-Bedding Mastic Tape Sealant: Preformed, butyl-based elastomeric tape sealant with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
1. AAMA 806.3 tape, for applications in which tape is subject to continuous pressure.
 2. AAMA 807.3 tape, for applications in which tape is not subject to continuous pressure.

2.6 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material and type that are non-staining; are compatible with joint substrates, sealers, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type Closed-Cell, and of a size and density to control sealant depth and otherwise contribute to producing optimal sealant performance.
1. Uses: Exterior facades, and where indicated.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure

2.7 MISCELLANEOUS MATERIALS

- A. Primer: Provide type recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates, as determined from preconstruction joint sealer-substrate and field tests.
- B. Cleaners: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and non-porous surfaces in any way, and formulated to promote optimal adhesion of sealants to joint substrates
- C. Masking Tape: Provide non-staining, non-absorbent type compatible with joint sealants and to surfaces adjacent to joints.
- D. Accessory Materials for Fire-Stopping Sealants: Provide accessory materials required for installation of fire-stopping sealants, refer to Division 7 Section "Penetration Firestopping".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. **Surface Cleaning of Joints:** Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer and the following requirements:
1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 2. Clean concrete, masonry, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
 3. Remove laitance and form release agents from concrete.
 4. Clean metal, glass, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
 5. **Joint Priming:** Prime all joint substrates whether or not indicated or recommended by joint sealant manufacturer. Apply primer to comply with joint sealant manufacturer's recommendations.
 6. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.
- B. **Masking Tape:** Use masking tape where required to prevent contact of primers, cleaners and joint sealants with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears.
1. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. **General:** Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. **Sealant Installation Standard:** Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. **Installation of Sealant Backings:** Install sealant backings complying with the following requirements:
1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint
 2. Do not leave gaps between ends of joint fillers.
 3. Do not stretch, twist, puncture, or tear joint fillers.
 4. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.
- D. Install bond breaker tape behind joint sealants where backings are not to be used between sealants and back of joints.

- E. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.
- F. Tooling of Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
1. Provide joint configuration as indicated on the drawings, and complying with ASTM C 1193.
 - a. Concave Joints: As per the referenced standard; Figure 5A, where indicated.
 - b. Recessed Joints: As per the referenced standard; Figure 5C, with recess depth of 1/4" from face material; and at locations indicated. Use masking tape to protect adjacent surfaces of recessed tooled joints.
 - c. Flush Joints: As per the referenced standard; Figure 5B, where indicated.
- G. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, and to comply with sealant manufacturer's directions for installation methods, materials, and tools that produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in conformance with sealant manufacturer's recommendations.
- H. Installation of Fire-Stopping Sealant: Install sealant and accessory materials to fill openings penetrating floors and walls to provide fire-stops with required fire resistance ratings. Refer to Division 7 Section "Penetration Firestopping" for additional requirements.
- I. Installation of Acoustic Sealant: Install sealant and accessory materials to fill openings penetrating floors and walls to provide air-stops with required acoustic ratings.
1. Acoustical sealant shall be applied in continuous beads. The material shall be resilient and non-setting.
 2. Seal sound-rated partitions on both sides where facings abut dissimilar materials. Fill void with 1/4" minimum to 3/8" maximum round bead of sealant, as required.
 3. Seal at the following locations:
 - a. Around the perimeter, in the angle formed by panels and abutting dissimilar materials.
 - b. At all intersections, and all penetrations of floor, ceiling, walls, columns.
 - c. At all panel terminations in door and window frames, and at control joint to panels.
 - d. Around all cutouts for lights, cabinets, pipes and plumbing, HVAC ducts, electrical boxes, etc.

3.4 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide doors and frames in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:
1. Flush design hollow construction type steel doors, as indicated.
 2. Fully welded, steel door frames, as indicated.
 3. Louvers in steel doors.
 4. Fire-resistance rated doors and frames, where indicated.
- B. Related Sections:
1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
 2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
 3. Division 1 Section "Construction Waste Management".
 4. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:
1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
 2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).

5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.
- B. Product Data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes.
 - C. Shop Drawings: Submit details of each frame type, elevations of door types, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections. Show anchorage and accessories.
 1. Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.
 2. Coordinate glazing frames and stops with glazing requirements.
 3. Prior to fabrication of steel door and frame assemblies, verify actual wall thicknesses, partition types, and thoroughly review the design intent indicated on the Drawings.
 - D. Samples: For the following items, prepared on Samples about 12 by 12 inches to demonstrate compliance with requirements for quality of materials and construction:
 1. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
 2. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow metal panels and glazing if applicable.

1.4 QUALITY ASSURANCE

- A. Standard: Provide doors and frames complying with ANSI/SDI A250.8 and as specified within this Section.
- B. Source Limitations: Obtain hollow metal work from single source from single manufacturer.
- C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10B.
 1. Fire Rating: As indicated on the Drawings.
 2. Temperature-Rise Limit: Where indicated, provide doors that have a maximum transmitted temperature end point of not more than 250 deg C above ambient after 30 minutes of standard fire-test exposure.
- D. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
- B. Inspect doors and frames on delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to the Commissioner; otherwise, remove and replace damaged items as directed.

- C. Store doors and frames at building site under cover. Place units on minimum 4-inch- high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If cardboard wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to promote air circulation.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating standard steel frames without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.7 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Amweld Building Products, LLC.
 - 2. Ceco Door Products; an Assa Abloy Group company.
 - 3. Curries Company; an Assa Abloy Group company.
 - 4. Steelcraft; an Ingersoll-Rand company.
 - 5. Approved equal.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Frame Anchors: ASTM A 591, Commercial Steel (CS), 40Z coating designation; mill phosphatized.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153.
- E. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.
- F. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143.

- G. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 96- to 192-kg/cu. m density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

2.3 STANDARD HOLLOW METAL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
 - 1. Design: Flush panel.
 - 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.
 - a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
 - 3. Vertical Edges for Single-Acting Doors: Manufacturer's standard.
 - a. Beveled Edge: 1/8 inch in 2 inches.
 - 4. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch radius.
 - 5. Top and Bottom Edges: Closed with flush or inverted 0.042-inch thick, end closures or channels of same material as face sheets.
 - 6. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- B. Interior Doors: Face sheets fabricated from cold-rolled steel sheet, unless metallic-coated sheet is indicated; 0.0478-inch thick. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 - 1. Level 2 and Physical Performance Level B (Heavy Duty), Model 2 (Seamless).
- C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- D. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile. Fabricate frames for doors, transoms, and sidelites, with mitered or coped corners; of welded construction.
- B. Interior Frames: Fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated.
 - 1. Frames for Steel Doors: 0.053-inch thick steel sheet.

- C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.5 LOUVERS

- A. Provide louvers for doors indicated, with blades or baffles formed of minimum 0.020 inch thick, steel sheet set into minimum 0.032-inch thick steel frame.
1. Sightproof Louver: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.

2.6 FRAME ANCHORS

- A. Jamb Anchors:
1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick
 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
 3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
 4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:
1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.7 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.
- C. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 6. Jamb Anchors: Provide number and spacing of anchors as follows:

- a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - 5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.
 - c. Compression Type: Not less than two anchors in each jamb.
 - d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
- a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- D. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware."
1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.

2.8 STEEL FINISHES

- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
- B. Refer to Division 9 Section "Painting" for applications of field painted finishes to steel doors and frames specified within this Section.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
 - 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-protection-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable glazing stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

- a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
5. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
6. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 11/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
 1. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION 081113

SECTION 081416 - WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide wood doors in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Solid-core pocket doors.
2. Wood door frames.
3. Factory fitting wood doors to frames and factory machining for hardware.

- B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction Waste Management".
4. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:
1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
 2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.

- B. Product Data: For each type of door indicated, include details of core and edge construction, and trim for openings. Include factory-finishing specifications.
- C. Shop Drawings: Submit detailed shop drawings indicating location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
 - 1. Indicate dimensions and locations of mortises and holes for hardware.
 - 2. Indicate dimensions and locations of cutouts.
 - 3. Indicate doors to be factory finished and finish requirements.
- D. Samples:
 - 1. Finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish.
 - 2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain wood doors through one source from a single manufacturer.
- B. Quality Standards:
 - 1. In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated."
 - a. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.
 - 2. WDMA I.S.1-A, "Architectural Wood Flush Doors."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with WDMA pamphlet "How to Store, Handle, Finish, Install and Maintain Wood Doors" and with manufacturer's instructions and with applicable requirements of referenced door standard.
- B. Package doors individually in plastic bags or cardboard cartons, unless otherwise indicated.
- C. Identify each door and each frame with individual opening numbers which correlate with shop drawing designation system for doors, frames and hardware, using temporary, removable or concealed markings.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship, or have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 2. Warranty shall be in effect during the following period of time from date of Substantial Completion:
 - a. Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 DOOR CONSTRUCTION, GENERAL

- A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.
- B. WDMA I.S.1-A Performance Grade: Extra Heavy Duty, unless otherwise indicated.
- C. Structural-Composite-Lumber-Core Doors:
1. Structural Composite Lumber: WDMA I.S.10.

2.2 DOORS FOR OPAQUE (PAINTED) FINISH

- A. Available Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Algoma Hardwoods, Inc.
 2. Graham; an Assa Abloy Group company.
 3. Mohawk Flush Doors, Inc.; a Masonite company.
 4. Approved equal.
- B. Interior Solid-Core Doors:
1. Grade: Premium.
 2. Species: Any closed grain hardwood; subject to the Commissioner's approval.
 3. Cut: As indicated, matching approved samples.
 4. Exposed Vertical and Top Edges: Any closed-grain hardwood.
 5. Core: Structural composite lumber.
 6. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.
- C. Mark, label, or otherwise identify stile and rail wood doors as complying with WDMA I.S.6A and grade specified
- D. Hardware: Refer to the Drawings for hardware components, sets, and finishes.

2.3 DOOR FRAMES

- A. Quality Standard: Comply with AWI Section 900.
- B. Grade: Premium.
- C. Interior Wood Door Frames: Solid wood frames, with or without casings, complete with transom and sidelite frames, fabricated from veneered structural composite lumber for transparent finish or solid lumber close grained hardwood for opaque finish.
- D. Wood Species: Any closed grain hardwood, subject to the Commissioner's approval.
- E. Provide door frames and other surround conditions with indicated finish to match doors and adjoining construction as closely as possible, unless otherwise indicated or directed by the Commissioner.

2.4 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 - 1. Comply with requirements in NFPA 80 for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
 - 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
 - 2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

2.5 FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- B. Doors for Opaque Finish: Shop prime doors with one coat of wood primer specified in Division 9 Section "Painting". Seal all four edges, edges of cutouts, and mortises with primer.
 - 1. Field finishing shall be specified in Division 9 Section "Painting".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.

2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

B. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.

1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.

2. Bevel doors 1/8 inch in 2 inches at lock and hinge edges.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Wood Door Frames: Anchor and install wood door frames in accordance with the referenced standards, AWI and WDMA, and specified finish hardware manufacturer's tolerances.

E. Apply hardware in accordance with hardware manufacturer's instructions. Adjust door installation to provide uniform clearance at head and jambs, and to contact stops uniformly. Remove and replace components which are defective.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

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SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide access doors in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Access doors and frames for walls and ceilings.
2. Access doors and frames for floors.

B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria

1.3 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:
1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
 2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.

- B. Product Data: For each type of product, include construction details, materials, individual components and profiles, and finishes.
 - C. Shop Drawings:
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Detail fabrication and installation of access doors and frames for each type of substrate.
 - D. Samples: For each door face material, at least 3 by 5 inches in size, in specified finish.
 - E. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.
- 1.4 QUALITY ASSURANCE
- A. Source Limitations: Obtain each type of access door(s) and frame(s) through one source from a single manufacturer.
 - B. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. NFPA 252 or UL 10B for vertical access doors and frames.
 - 2. ASTM E 119 or UL 263 for horizontal access doors and frames.
 - C. Size Variations: Obtain Commissioner's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.
- 1.5 COORDINATION
- A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879, with cold-rolled steel sheet substrate complying with ASTM A 1008, Commercial Steel (CS), exposed.
- C. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304 or 316 for corrosive or wet areas. Remove tool and die marks and stretch lines or blend into finish.
 - 1. Finish: Directional Satin Finish, No. 4.
- D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153 or ASTM F 2329.

2.2 ACCESS DOORS AND FRAMES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Acudor Products, Inc.
 2. J. L. Industries, Inc.; Div. of Activar Construction Products Group.
 3. Larsen's Manufacturing Company.
 4. Karp.
 5. Approved equal.
- B. Recessed Access Doors with Gypsum Board Finish (Typical): Fabricate door in the form of a pan recessed for gypsum board infill. Provide frame with gypsum board bead for concealed flange installation. Fabricate from steel sheet in typical areas.
1. Locations: Walls and ceilings.
 2. Door Size: As selected by the Architect.
 3. Door: Minimum 0.060 inch thick sheet metal.
 4. Frame Material: Same material and thickness as door.
 5. Hinges: Spring-loaded, concealed-pin type.
 6. Latch: Screwdriver-operated cam latch.
 7. Locations: Typical areas, or as indicated on the Drawings.
- C. Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet in typical areas, stainless steel in bathrooms and wet areas.
1. Locations: Wall and ceiling surfaces.
 2. Door: Minimum 0.060-inch thick sheet metal, set flush with exposed face flange of frame.
 3. Frame: Minimum 0.060-inch thick sheet metal with 1-inch wide, surface-mounted trim.
 4. Hinges: Spring-loaded, concealed-pin type.
 5. Latch: Screwdriver-operated cam latch.
- D. Fire-Rated, Flush Access Doors and Trimless Frames: Fabricated from steel sheet in typical areas, stainless steel in bathrooms or wet areas.
1. Locations: Walls and ceilings.
 2. Fire-Resistance Rating: Not less than that of adjacent construction.
 3. Temperature Rise Rating: 250 deg F at the end of 30 minutes.
 4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch.
 5. Frame: Minimum 0.060-inch thick sheet metal with drywall bead.
 6. Hinges: Continuous piano.
 7. Automatic Closer: Spring type.
 8. Latch: Self-latching device operated by knurled knob with interior release.
- E. Steel Angle-Frame Floor Door: Single-leaf opening. Galvanized-steel frame with minimum 3/16 thick, diamond-pattern, galvanized-steel tread plate door; nonwatertight; loading capacity to support minimum 150-lbf/sq. ft. pedestrian live load.
1. Hardware: Provide the following:
 - a. Hinges: Heavy-duty, zinc-coated steel butt hinges with stainless-steel pins.
 - b. Lock: Keyed deadlock bolt

- c. Hardware Material: Stainless steel, including latch and lifting mechanism assemblies, hold-open arms, and all brackets, hinges, pins, and fasteners.

2.3 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.
1. For concealed flanges with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
 2. Provide mounting holes in frames for attachment of units to metal framing.
 3. Provide mounting holes in frame for attachment of masonry anchors.
- D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.
- E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
1. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

2.4 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
1. Surface Preparation for Steel Sheet: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
 2. Field Finish:
 - a. Factory-Primed Finish: Apply shop primer immediately after cleaning and pretreating.
 - b. Painted Finish: Refer to Division 9 Section "Painting" for materials and field application requirements.

3. Factory Finish:

- a. Baked-Enamel Finish (Interior Doors and Frames): Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry-film thickness of 1 mil for topcoat

E. Stainless Steel Finishes:

1. Finish: Directional Satin Finish, No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Install doors flush with adjacent finish surfaces.

3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

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SECTION 083473 - SOUND CONTROL DOOR ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide sound control doors in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Steel sound-control doors.
2. Steel frames and sound-control seals.

- B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction Waste Management".
4. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:

1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.

- B. Product Data: For each type of product indicated, include sound ratings, construction details, material descriptions, core descriptions, fire-resistance rating, and finishes.
- C. Shop Drawings: Include the following:
 - 1. Elevations of each door design.
 - 2. Details of sound-control seals, door bottoms, and thresholds.
 - 3. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 - 4. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 5. Locations of reinforcement and preparations for hardware.
 - 6. Details of each different wall opening condition.
 - 7. Details of anchorages, joints, field splices, and connections.
 - 8. Details of accessories.
 - 9. Details of moldings, removable stops, and glazing.
 - 10. Details of conduit and preparations for power, signal, and control systems.
- D. Samples for Verification:
 - 1. Finishes: For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.
 - 2. Doors: Include section of vertical-edge, top, and bottom construction; automatic door bottom or gasket; core construction; and hinge and other applied hardware reinforcement.
 - 3. Frames: Include profile, corner joint, floor and wall anchors, and seals. Include separate section showing fixed sound panels if applicable.
- E. Schedule: Provide a schedule of sound-control door assemblies prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with the Door Hardware Schedule.
- F. Qualification Data: For qualified acoustical testing agency.
- G. Product Certificates: For each type of sound-control door assembly, from manufacturer.
- H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of sound-control door assembly.
- I. Field quality-control reports.
- J. Maintenance Data: For sound-control door assemblies to include in maintenance manuals.
- K. Warranty: Submit copies of special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Acoustical Testing Agency Qualifications: An independent agency accredited as an acoustical laboratory according to the National Voluntary Laboratory Accreditation Program of NIST.
- C. Source Limitations: Obtain sound-control door assemblies, including doors, frames, sound-control seals, hinges (when integral for sound control), thresholds, and other items essential for sound control, from single source from single manufacturer.

- D. Sound Rating: Provide sound-control door assemblies identical to those of assemblies tested as sound-retardant units by an acoustical testing agency, and have the following minimum rating:
1. STC Rating: 54 as determined by ASTM E 413 when tested in an operable condition according to ASTM E 90 and ASTM E 1408.
- E. Fire-Rated Door Assemblies: Assemblies listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
- F. Smoke- and Draft-Control Door Assemblies: Where indicated, provide assemblies tested according to UL 1784.
1. Air-Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. at the tested pressure differential of 0.3-inch wg of water.
- G. Preinstallation Conference: Conduct conference at Project site.
1. Review required field quality-control procedures.
 2. Review procedures for coordinating frame and anchor installation with wall construction.
 3. Review frame grouting procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
1. Provide additional protection to prevent damage to finish of factory-finished wood doors.
- B. Shipping Spreaders: Deliver welded frames with two removable spreader bars across bottom of frames, tack welded or mechanically attached to jambs and mullions.
- C. Store doors and frames under cover at Project site. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch-high, wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber.
1. If wrappers on doors become wet, remove cartons immediately. Provide a minimum of 1/4-inch space between each stacked door to permit air circulation.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install wood sound-control wood doors until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

- A. Coordinate installation of anchorages for sound-control door assemblies. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of sound-control door assemblies that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Failure to meet sound rating requirements.
 - b. Faulty operation of sound seals.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal use or weathering.
 - d. Wood doors that are warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
2. Warranty Period for Steel Doors: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Ceco Door; an ASSA ABLOY Group company.
 2. IAC.
 3. Krieger Specialty Products Company.
 4. Pioneer Industries, Inc.
 5. Security Acoustics; a division of Security Metal Products Corp.
 6. Approved equal.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Frame Anchors: ASTM A 653, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 metallic coating.
- C. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A 153 or ASTM F 2329.
- D. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching sound-control door frames of type indicated.

- E. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers.

2.3 STEEL SOUND-CONTROL DOORS

- A. Basis of Design: Provide double leaf, "Noise Lock" acoustic door and frame with cam lift hinges and split frames as manufactured by IAC, or approved equal.
- B. Description: Provide flush-design sound-control doors, 3-1/2 inches thick, of seamless construction; with manufacturer's standard sound-retardant core as required to provide STC and fire rating indicated. Construct doors with smooth, flush surfaces without visible joints or seams on exposed faces or stile edges. Fabricate according to ANSI/NAAMM-HMMA 865.
1. Interior Doors: Fabricate from cold-rolled steel sheet unless otherwise indicated, minimum 14 gage (0.0747-inch) nominal thickness, or thicker as required to achieve STC rating indicated.
 2. Top and Bottom Channels: Closed with continuous channels of same material as face sheets, spot welded to face sheets not more than 6 inches o.c.
 3. Hardware Reinforcement: Same material as face sheets.
- C. Finishes:
1. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
 - a. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
 2. Field Finish: Refer to Division 9 Section "Painting" for materials and products.

2.4 SOUND-CONTROL FRAMES

- A. Description: Fabricate sound-control door frames with corners mitered, reinforced, and continuously welded full depth and width of frame. Fabricate according to ANSI/NAAMM-HMMA 865.
1. Weld frames according to NAAMM-HMMA 820.
 2. Interior Frames: Fabricate from cold-rolled steel sheet unless otherwise indicated, minimum 14 gage (0.0747-inch) nominal thickness, or thicker as required to provide STC rating indicated.
 3. Sound-Control Panel Stops: Formed integral with frames, a minimum of 5/8 inch high, unless otherwise indicated.
 4. Hardware Reinforcement: Fabricate according to ANSI/NAAMM-HMMA 865 of same material as face sheets.
 5. Head Reinforcement: Reinforce frames with metallic-coated steel channel or angle stiffener, 0.108-inch nominal thickness, welded to head.
 6. Jamb Anchors:
 - a. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.064-inch nominal thickness metallic-coated steel with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.156 inch thick.

- b. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.048-inch nominal thickness uncoated steel unless otherwise indicated.
 - c. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- diameter, metallic-coated steel bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
7. Floor Anchors: Not less than 0.079-inch nominal thickness metallic-coated steel, and as follows:
- a. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
 - b. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.
8. Ceiling Struts: Minimum 3/8-inch-thick by 2-inch- wide uncoated steel unless otherwise indicated.
9. Plaster Guards: Metallic-coated steel sheet, not less than 0.026 inch thick.

B. Finishes:

1. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
- a. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
2. Field Finish: Refer to Division 9 Section "Painting" for materials and products.

2.5 SOUND-CONTROL HARDWARE

- A. Description:** Provide manufacturer's standard sound-control system, including head and jamb seals, door bottoms, cam-lift hinges, and thresholds, as required by testing to achieve STC and fire rating indicated.
- 1. Compression Seals: One-piece units; consisting of closed-cell sponge neoprene seal held in place by metal retainer; with retainer cover of same material as door frame; attached to door frame with concealed screws.
 - 2. Magnetic Seals: One-piece units; consisting of closed-cell sponge neoprene seal and resiliently mounted magnet held in place by metal retainer; with retainer cover of same material as door frame; attached to door frame with concealed screws.
 - 3. Automatic Door Bottoms: Neoprene or silicone gasket, held in place by metal housing, that automatically drops to form seal when door is closed; mounted to bottom edge of door with screws.
 - a. Mounting: Mortised or semimortised into bottom of door or surface mounted on face of door as required by testing to achieve STC rating indicated.
 - 4. Door Bottoms: Neoprene or silicone gasket held in place by metal housing; mortised into bottom edge of door.
 - 5. Cam-Lift Hinges: Full-mortise template type that raises door 1/2 inch when door is fully open; with hardened pin; fabricated from stainless steel.

6. Thresholds: Flat, smooth, unfluted type as recommended by manufacturer; fabricated from aluminum.
 - a. Finish: Clear anodic finish.
 7. Operator: Horton Coordinator/Operator complying with the following:
 - a. Active Leaf: Von Duprin 2 point surface vertical rod exit device with RX capability to control Coordinator/operator.
 - b. Inactive Leaf: No latching – to be held closed by the active leaf.
- B. Other Hardware: As indicated on the Drawings and Door Schedule.

2.6 SOUND-CONTROL ACCESSORIES

- A. Grout: Comply with ASTM C 476, with a slump of not more than 4 inches as measured according to ASTM C 143/C 143M.
- B. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.7 FABRICATION

- A. Sound-Control Steel Door Fabrication: Sound-control doors to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal.
 1. Seamless Edge Construction: Fabricate doors with faces joined at vertical edges by welding; welds shall be ground, filled, and dressed to make them invisible and to provide a smooth, flush surface.
 2. Exterior Doors: Close top edges flush and seal joints against water penetration. Provide weep-hole openings in bottom of exterior doors to permit moisture to escape.
 3. Glazed Lites: Factory install glazed lites according to requirements of tested assembly to achieve STC rating indicated. Provide fixed stops and moldings welded on secure side of door.
 4. Hardware Preparation: Factory prepare sound-control doors to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in "Door Hardware".
 - a. Reinforce doors to receive nontemplated mortised and surface-mounted door hardware.
 - b. Locate door hardware as indicated, or if not indicated, according to NAAMM-HMMA 831, "Recommended Hardware Locations for Custom Hollow Metal Doors and Frames."
 5. Tolerances: Fabricate doors to tolerances indicated in ANSI/NAAMM-HMMA 865.
- B. Sound-Control Wood Door Fabrication: Factory fit doors to suit frame-opening sizes indicated, with uniform clearances and bevels according to referenced quality standard, unless otherwise indicated. Comply with final door hardware schedules and hardware templates.
 1. Comply with clearance requirements in NFPA 80 for fire-rated doors.

2. Locate door hardware as indicated, or if not indicated, according to DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 - a. Coordinate measurements of hardware mortises in steel frames to verify dimensions and alignment before factory machining.
- C. Sound-Control Frame Fabrication: Fabricate sound-control frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
 1. Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated from same thickness metal as frames.
 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 3. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 4. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Two anchors per jamb up to 60 inches in height.
 - 2) Three anchors per jamb from 60 to 90 inches in height.
 - 3) Four anchors per jamb from 90 to 96 inches in height.
 - 4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof more than 96 inches in height.
 - b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches in height.
 - 2) Four anchors per jamb from 60 to 90 inches in height.
 - 3) Five anchors per jamb from 90 to 96 inches in height.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof more than 96 inches in height.
 - 5) Two anchors per head for frames more than 42 inches wide and mounted in metal stud partitions.
 - c. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
 5. Head Reinforcement: For frames more than 48 inches wide, provide continuous head reinforcement for full width of opening, welded to back of frame at head.
 6. Hardware Preparation: Factory prepare sound-control frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware."
 - a. Reinforce frames to receive nontemplated mortised and surface-mounted door hardware.

- b. Locate hardware as indicated, or if not indicated, according to NAAMM-HMMA 831, "Recommended Hardware Locations for Custom Hollow Metal Doors and Frames."
7. Plaster Guards: Weld guards to frame at back of hardware cutouts and glazing-stop screw and sound-control seal preparations to close off interior of openings in frames to be grouted.
8. Tolerances: Fabricate frames to tolerances indicated in ANSI/NAAMM-HMMA 865.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of sound-control door assemblies.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations of sound-control door frame connections before frame installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation and with installation spreaders in place, adjust and securely brace sound-control door frames to the following tolerances:
 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive nontemplated mortised and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install sound-control door assemblies plumb, rigid, properly aligned, and securely fastened in place; comply with manufacturer's written instructions.
- B. Frames: Install sound-control door frames in sizes and profiles indicated.
 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

- a. At fire-rated openings, install frames according to NFPA 80.
 - b. At openings requiring smoke and draft control, install frames according to NFPA 105.
 - c. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, and dress; make splice smooth, flush, and invisible on exposed faces.
 - d. Install sound-control frames with removable glazing stops located on secure side of opening.
 - e. Remove temporary braces only after frames or bucks have been properly set and secured.
 - f. Check squareness, twist, and plumbness of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. Apply corrosion-resistant coatings coating to backs of frames to be filled with mortar, grout, and plaster containing antifreezing agents.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with postinstalled expansion anchors.
- a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors, if so indicated and approved on Shop Drawings.
3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
5. Ceiling Struts: Extend struts vertically from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.
6. Grouted Frames: Solidly fill space between frames and substrate with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
7. Installation Tolerances: Adjust sound-control door frames for squareness, alignment, twist, and plumbness to the following tolerances:
- a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. Doors: Fit sound-control doors accurately in frames, within clearances indicated below. Shim as necessary.
1. Non-Fire-Rated Doors: Fit non-fire-rated doors accurately in frames with the following clearances:
 - a. Jambs: 1/8 inch.
 - b. Head with Butt Hinges: 1/8 inch.
 - c. Head with Cam-Lift Hinges: As required by manufacturer, but not more than 3/8 inch.

- d. Sill: Manufacturer's standard.
- e. Between Edges of Pairs of Doors: 1/8 inch.

2. Fire-Rated Doors: Install fire-rated doors with clearances according to NFPA 80.

- D. Sound-Control Seals: Where seals have been prefit and preinstalled in the factory and subsequently removed for shipping, reinstall seals and adjust according to manufacturer's written instructions.
- E. Cam-Lift Hinges: Install hinges according to manufacturer's written instructions.
- F. Thresholds: Set thresholds in full bed of sealant complying with requirements in Division 7 Section "Joint Sealants."

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Testing Services: Acoustical testing and inspecting agency shall select one sound-control door at random from sound-control door assemblies that are completely installed and perform testing for verification that assembly complies with STC rating requirements.
 - 1. Field tests shall be conducted according to ASTM E 336, with results calculated according to ASTM E 413. Acceptable field STC values shall be within 5 dB of laboratory STC values.
 - 2. Inspection Report: Acoustical testing agency shall submit report in writing to Commissioner and Contractor within 24 hours after testing.
 - 3. If tested door fails, replace or rework all sound-control door assemblies to bring them into compliance at Contractor's expense.
 - a. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- C. Prepare test and inspection reports.

3.5 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and adjust seals, door bottoms, and other sound-control hardware items right before final inspection. Leave work in complete and proper operating condition.
- B. Remove and replace defective work, including defective or damaged sound seals and doors and frames that are warped, bowed, or otherwise unacceptable.
 - 1. Adjust gaskets, gasket retainers, and retainer covers to provide contact required to achieve STC rating.
- C. Clean grout off sound-control door frames immediately after installation.
- D. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

END OF SECTION 083473

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SECTION 083513 - ALUMINUM FRAMED SLIDING WALL SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide sliding entrance assembly in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Sliding aluminum and glass door system, including aluminum frame, threshold, panels, sliding and locking hardware, weather stripping, glass and glazing; designed to provide an opening glass wall, with sizes and configurations as shown on drawings.

B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction Waste Management".
4. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: All-glass systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Delegated Design: Design all-glass systems, including comprehensive engineering analysis by a qualified professional engineer, licensed in the State of New York, using performance requirements and design criteria indicated.
- C. Structural Performance: All-glass systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to SEI/ASCE 7, New York City Building Code and performance requirements, whichever is greater.
1. Deflection Limits: Deflection normal to glazing plane is limited to 1/175 of clear span or 3/4 inch, whichever is smaller.

- D. **Glass Design:** Glass thicknesses indicated on Drawings are for detailing purposes only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for the various size openings in the thicknesses and strengths (i.e. annealed, heat-treated, laminated, tempered, etc.) to meet or exceed the following criteria:
1. Minimum glass thickness, nominally, of lites in exterior walls is 1/2 inch.
 2. Aesthetic effects for each glass type indicated are the same throughout Project.
 3. Minimum glass thicknesses of lites, whether composed of annealed or heat-treated glass, are selected so the worst-case probability of failure does not exceed the following:
 - a. 8 lites per 1000 for lites set vertically or not over 15 degrees off vertical and under wind action. Determine minimum thickness of monolithic annealed glass according to ASTM E 1300. For other than monolithic annealed glass, determine thickness per glass manufacturer's standard method of analysis including applying adjustment factors to ASTM E 1300 based on type of glass.
- E. **Air Leakage Resistance:** Maximum rate not more than indicated when tested according to AAMA/WDMA/CSA 101/I.S.2/A440, Air Leakage Resistance Test.
1. Maximum Rate: 0.3 cfm/sq. ft. of area at an inward test pressure of 6.24 lbf/sq. ft.
- F. **Water Penetration Resistance:** No water leakage as defined in the AAMA/WDMA/CSA referenced test methods at a water test pressure equaling that indicated, when tested according to AAMA/WDMA/CSA 101/I.S.2/A440, Water Penetration Resistance Test.
1. Test Pressure: 20 percent of positive design pressure, but not more than 12 lbf/sq. ft.
- G. **Condensation Resistance:** Provide sliding aluminum-framed glass doors with a minimum of 52.
- H. **Thermal Transmittance:** Provide sliding aluminum-framed glass doors with a maximum whole fenestration product U-factor indicated, when tested according to AAMA 1503.
1. U-Factor: 0.65 Btu/sq. ft. x h x deg F.
- I. **Thermal Movements:** Allow for thermal movements resulting from the following ambient and surface temperature changes.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.4 SUBMITTALS

- A. **LEED BUILDING Submittal Requirements:** The contractor or subcontractor shall submit the following LEED BUILDING certification items:
1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
 2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.

4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.
- B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for all-glass system.
- C. Shop Drawings: Show fabrication and installation details, including the following:
1. Plans, elevations, and sections.
 2. Indicate dimensioning, direction of swing, configuration, swing panels, typical head jamb, side jambs and sill details, type of glazing material, and handle height.
 3. Door hardware locations, mounting heights, and installation requirements.
 4. Include setting drawings, templates, and directions for the installation of anchor bolts and other anchorages installed as a unit of work under other sections.
 5. Indicate where and how the system deviates from contract drawings and specifications. Show section moduli of wind-load-bearing members and calculations of stresses and deflections. Provide material properties and other information needed for structural analysis including computations, prepared, signed, or, and sealed by a professional engineer licensed in the State of New York.
 6. Each shop drawing sheet shall contain the seal of a professional engineer licensed in the State of New York retained by the Contractor and a written statement that the metal and glass curtainwall systems conform to Project requirements, applicable codes, and specified conditions.
- D. Samples for Initial Selection: For each type of exposed finish indicated.
- E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
1. Metal Finishes: 6-inch- long sections of rail fittings, accessory fittings, and other items.
 2. Door Hardware: For exposed door hardware of each type, in specified finish, full size.
- F. Fabrication Sample: Of fitting at bottom of all-glass systems, made from 12-inch lengths of full-size components and showing details of the following:
1. Joinery.
 2. Anchorage.
 3. Glazing.
- G. Other Action Submittals:
1. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, sidelights, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.
- H. Qualification Data: For qualified Installer.

- I. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for all-glass systems.
- J. Maintenance Data: For all-glass systems to include in maintenance manuals.
- K. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Engineering Responsibility: Prepare data for all-glass systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.
- C. Source Limitations: Obtain all-glass systems from single source from single manufacturer.
- D. Preinstallation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with all-glass systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of all-glass systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

- a. Structural failures including excessive deflection, air infiltration, or water leakage.
- b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- c. Failure of operating components.

2. Warranty Period:

- a. Ten years for rollers and for seal failure of insulated glass supplied. For all other components, two years.

- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. EFCO.
 2. Kawneer.
 3. NanaWall Systems Inc.
 4. Approved equal.
- B. Basis-of-Design: Subject to compliance with requirements, provide HSW60, by NanaWall Systems Inc., or approved equal.

2.2 MATERIALS

- A. Aluminum Extrusions: ASTM B221. Provide alloy and temper recommended by sliding aluminum-framed glass door manufacturer for strength, corrosion resistance, and application of required finish. Comply with AAMA/WDMA/CSA 101/I.S.2/A440.
- B. Fasteners: Provide fasteners of nonmagnetic stainless steel, or other materials warranted by manufacturer to be noncorrosive for SC 3 severe service conditions and compatible with members, trim, hardware, anchors, and other components of sliding aluminum-framed glass doors. Comply with AAMA/WDMA/CSA 101/I.S.2/A440.
1. Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.
- C. Anchors, Clips, and Accessories: Provide anchors, clips, and accessories of nonmagnetic stainless steel, or zinc-coated steel or iron for sliding aluminum-framed glass doors, complying with ASTM B 456 or ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
- D. Reinforcing Members: Provide aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel reinforcing members that are noncorrosive for SC 3 severe service conditions and that comply with AAMA/WDMA/CSA 101/I.S.2/A440; provide sufficient strength to withstand design pressure indicated.
- E. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action, and completely concealed when sliding aluminum-framed glass door is closed.
1. Weather-Stripping Material: Manufacturer's standard system and materials complying with AAMA/WDMA/CSA 101/I.S.2/A440.
- F. Sliding-Type Weather Stripping: Provide woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric. Comply with AAMA 701.
1. Weather Seals: Provide weather stripping with integral barrier fin or fins of semirigid, polypropylene sheet or polypropylene-coated material. Comply with AAMA 702.

- G. Sealant: For sealants required within fabricated doors, provide sliding aluminum-framed glass door manufacturer's standard, permanently elastic, nonshrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.

2.3 GLAZING

- A. Glass and Glazing System: Comply with Division 8 Section "Glazing" for safety glass, insulating-glass units, laminated glass, and glazing requirements applicable to glazed sliding aluminum-framed glass doors.

2.4 FABRICATION

- A. Fabricate sliding aluminum-framed glass doors in sizes indicated. Include a complete system for assembling components and anchoring doors.
- B. Fabricate sliding aluminum-framed glass doors that are reglazable without dismantling panel framing.
- C. Thermally Improved Construction: Fabricate sliding aluminum-framed glass doors with an integral, concealed, low-conductance thermal barrier; locate between exterior materials and door members exposed on interior side, and in a manner that eliminates direct metal-to-metal contact.
 - 1. Provide thermal-break construction that has been in use for not less than three years and has been tested to demonstrate resistance to thermal conductance and condensation and to show adequate strength and security of glass retention.
- D. Weather Stripping: Provide operable panels with a double row of sliding weather stripping in horizontal rails and double-row weather stripping in meeting or jamb stiles. Provide compression-type weather stripping at the perimeter of each movable panel where sliding-type weather stripping is not appropriate.
 - 1. Provide weather stripping locked into extruded grooves in door panels or frames.
- E. Weep Holes: Provide weep holes and internal drainage passages to conduct infiltrating water to exterior.
- F. Factory-Glazed Fabrication: Glaze sliding aluminum-framed glass doors in the factory where practical and possible for applications indicated. Comply with requirements in Division 08 Section "Glazing" and with AAMA/WDMA/CSA 101/I.S.2/A440.
- G. Glazing Stops: Provide snap-on glazing stops coordinated with Division 8 Section "Glazing" and with glazing system indicated. Provide glazing stops to match panel frames.
- H. Locking Hardware and Handles: Provide Commissioner selected handle and concealed two point locking hardware operated by 180 degree turn of handle between each pair of sliding panels and on any secondary swing panel.
- I. Sliding Hardware: Provide manufacturer's standard hardware, fabricated from a corrosion-resistant material compatible with aluminum complying with AAMA 907 and designed to smoothly operate, tightly close, and securely lock sliding aluminum-framed glass doors. Do not use aluminum in frictional contact with other metals. Where exposed, provide nonmagnetic stainless steel.
 - 1. Hardware Finish: Manufacturer's standard.

2. Roller Assemblies: Unidirectional sliding panel carriers with a one wheeled, polyimide guide roller that are attached to the panels with stainless steel rods. Maximum carrying capacity of two carriers on a panel shall be 330 lbs.
3. Threshold and Sill Cap/Track: Provide extruded-aluminum threshold and track of thickness, dimensions, and profile indicated; designed to comply with performance requirements indicated and to drain to the exterior with manufacturer's standard finish.
4. Door Pulls: Provide manufacturer's standard extruded-aluminum or stainless steel pulls/levers.
5. Lock: Install manufacturer's keyed cylinder lock and locking rod assembly on each movable panel, lockable from the inside and outside. Adjust locking device to allow unobstructed movement of the panel across adjacent panel in the direction indicated.
 - a. Keying System: All cylinders keyed alike.
6. Provide on all four corners of sliding panels, thermally broken, die cast zinc multi-functional corner fittings with carrier connectors, male and female locking receptacles, a required or recommended by the manufacturer.

2.5 ALUMINUM FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- C. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 1. Color and Gloss: As selected by Commissioner from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Verify rough opening dimensions, levelness of threshold substrate, and operational clearances.
- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight sliding aluminum-framed glass door installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing doors, hardware, accessories, and other components.

- B. Install sliding aluminum-framed glass doors level, plumb, square, true to line, without distortion, warp or rack of frames and panels, or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing, vapor retarders, air barriers, water/weather barriers, and other adjacent construction.
- C. Set sill members in bed of sealant or with gaskets, as indicated, to provide weathertight construction.
- D. Install sliding aluminum-framed glass doors and components to drain condensation, water penetrating joints, and moisture migrating within doors to the exterior.
- E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials according to ASTM E 2112, Section 5.12 "Dissimilar Materials."

3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Lubricate hardware and moving parts.
- B. Adjust operating panels and screens to provide a tight fit at contact points and weather stripping for smooth operation, without binding, and a weathertight closure.
- C. Adjust hardware for proper alignment, smooth operation, and proper latching without unnecessary force or excessive clearance.
- D. Clean aluminum surfaces immediately after installing sliding doors. Comply with manufacturer's written recommendations for final cleaning and maintenance. Avoid damaging protective coatings and finishes. Remove nonpermanent labels, and clean surfaces.
- E. Clean glass immediately after installing sliding aluminum-framed glass doors. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels and clean surfaces.
- F. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- G. Protect sliding door surfaces from contact with contaminating substances resulting from construction operations. During construction, monitor sliding door surfaces adjacent to and below exterior concrete and masonry surfaces for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact sliding door surfaces, remove contaminants immediately according to manufacturer's written instructions.
- H. Refinish or replace sliding aluminum-framed glass doors with damaged finishes.
- I. Replace damaged components.

END OF SECTION 083513

SECTION 084113 – INTERIOR ALUMINUM STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide storefronts in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Interior aluminum and glass storefronts.
2. Anchorages, shims, fasteners, accessories, and support brackets.

- B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction Waste Management".
4. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:
- B. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- C. Sound Transmission: Provide aluminum-framed systems with fixed glazing and framing areas having the following sound-transmission characteristics:
1. Sound Transmission Class (STC): Minimum 35 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.

1.4 SUBMITTALS

- A. **LEED BUILDING Submittal Requirements:** The contractor or subcontractor shall submit the following LEED BUILDING certification items:
1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
 2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (if an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.
- B. **Product Data:** Submit manufacturer's product data including construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of aluminum entrance and storefront indicated.
- C. **Shop Drawings:** For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
1. Include details of provisions for system expansion and contraction.
- D. **Samples for Initial Selection:** For units with factory-applied color finishes.
- E. **Samples for Verification:** For each type of exposed finish required, in manufacturer's standard sizes.
- F. **Fabrication Sample:** Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12 inch lengths of full-size components and showing details of the following:
1. Joinery, including concealed welds.
 2. Anchorage.
 3. Expansion provisions.
 4. Glazing.
- G. **Certificates:** Submit certificates showing compliance with performance and Building Code requirements.
- H. **Test Reports:** Submit material and product test reports showing compliance with performance and Building Code requirements.

1.5 QUALITY ASSURANCE

- A. **Welding Qualifications:** Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."

- B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Build mockup of typical wall area as shown on Drawings.
 2. Field testing shall be performed on mockups according to requirements in "Field Quality Control" Article.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Commissioner specifically approves such deviations in writing.
 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
1. Warranty Period: 10 years from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.
1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, provide entrance and storefront assemblies as manufactured by one of the following:
1. EFCO.
 2. Kawneer North America; an Alcoa company.
 3. Wausau Window and Wall Systems.
- B. Basis-of-Design: Subject to compliance with requirements, provide Trifab 451 by Kawneer North America; an Alcoa company or approved equal.

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
1. Sheet and Plate: ASTM B 209.
 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
- B. Steel Reinforcement: Complying with ASTM A 36 for structural shapes, plates, and bars; ASTM A 1008 for cold-rolled sheet and strip; or ASTM A 1011 for hot-rolled sheet and strip.

2.3 FRAMING SYSTEMS

- A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
- B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.
 - 3. Use exposed fasteners with countersunk Phillips screw heads, fabricated from stainless steel.
- D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123 or ASTM A 153.
- E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

2.4 GLAZING

- A. Glazing: Provide glazing as indicated on the Drawing, and in compliance with requirements of Division 8 Section "Glazing." Fabricate to sizes required with edge clearances and tolerances that comply with manufacturer's recommendations.
- B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

2.5 ACCESSORY MATERIALS

- A. Joint Sealants: Provide silicone sealants approved by the manufacturer of the system, complying with ASTM C920, and Division 7 Section "Joint Sealants."
- B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

2.6 FABRICATION

- A. General: Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
- B. Thermal-Break Construction: Fabricate storefront framing system with an integrally concealed, low-conductance thermal barrier, located between exterior materials and exposed interior members to eliminate direct metal-to-metal contact.
 - 1. Form or extrude aluminum shapes before finishing.

- C. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- D. Storefront Framing: Fabricate components for assembly using shear-block system.

2.7 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.
- B. High-Performance Organic Finish: 2-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss: Color and gloss as selected by the Commissioner; to match adjoining finished windows, curtain walls, and metal panels.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Notify the Commissioner and City of New York in writing of conditions unsatisfactory for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install assemblies in accordance with manufacturer's instructions and approved shop drawings, using workers specifically trained in the installation of this type of work.
- B. Set units plumb, level, and true to line, without warp or rack of framing members. Install components in proper alignment and relation to established lines and grades. Provide proper support and anchor securely in place.
- C. Metal Protection:
 - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
 - 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- D. Glazing: Install glazing as specified in Division 8 Section "Glazing."
- E. Install perimeter joint sealants as specified in Division 7 Section "Joint Sealants."

3.3 ERECTION TOLERANCES

- A. Install aluminum-framed systems to comply with the following maximum erection tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
2. Alignment:
 - a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
 - c. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

END OF SECTION 084113

SECTION 085113 – ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide interior windows in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Sliding aluminum-framed interior windows at Control Booths MU3 and 2U2.
2. Fixed/removable aluminum-framed interior windows with enhanced sound transmission characteristics for soundproofing.
3. Replacement in-swing casement window at existing exterior lites.

- B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction Waste Management".
4. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Provide aluminum windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified, and that are of minimum test size indicated below:

1. Size indicated on Drawings or required by AAMA/WDMA 101/I.S.2/NAFS for optional performance grade.

- B. Design Loads for Exterior Casement Window: No deflection of any unsupported span L of test unit (framing rails, muntins, mullions, etc.) in excess of L/175 at 40 psf positive and 66 psf negative when tested in accord with ASCE-7, or New York City Building Code, whichever is more stringent.

- C. Structural Performance for Exterior Casement Window:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches, and to 1/240 of clear span plus 1/4 inch, for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.

2. Deflection Parallel to Glazing Plane: Limited amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and which reduces edge clearance between framing members and glazing of other fixed components to less than 1/8 inch.
 3. Operable Units: Provide a minimum of 1116 inch clearance between framing members and operable units.
- D. Air Infiltration for Exterior Casement Window: Maximum rate not more than indicated when tested according to AAMA/WDMA 101/I.S.2/NAFS, Air Infiltration Test.
1. Maximum Rate: 0.10 cfm/sq. ft. of area at an inward test pressure of 6.24 lbf/sq. ft.
- E. Water Penetration for Exterior Casement Window: No water penetration as defined in the test method at a static air pressure difference of 12.0 psf, in accordance with ASTM E 331.
- F. Condensation Resistance Factor for Exterior Casement Window: With window sash and ventilators closed and locked, test unit in accordance with AAMA 1503.1.
1. Condensation Resistance Factor (CRF) shall be minimum 50.
- G. Thermal Transmittance for Exterior Casement Window: With window sash and ventilators closed and locked, test unit in accordance with AAMA 1503.1.
1. Conductive thermal transmittance (U-value) shall be maximum 0.50 BTU/hr/sq-ft/deg. F.
- H. Solar Heat Gain Coefficient for Exterior Casement Window: 0.30 maximum for overall window assembly.
- I. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F material surfaces.
- J. Acoustic Performance: For soundproofed assemblies, provide interior aluminum windows with a Sound Transmission Coefficient (STC) of 44; in accordance with ASTM E 90 and the manufacturers design.

1.4 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:
1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
 2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.

4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.
- B. Product Data: Submit product data that verify or are required to ensure compliance with the Contract Documents, to include technical information, shop drawings, samples, calculations, product test reports, etc.
- C. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, installation details, and the following:
1. Mullion details, including reinforcement and stiffeners.
 2. Joinery details.
 3. Expansion provisions.
 4. Glazing details.
 5. Hardware for sliding units.
- D. Samples for Verification: For aluminum windows and components required, prepared on Samples of size indicated below.
1. Main Framing Member: 12-inch long, full-size sections of extrusions with factory-applied color finish.
 2. Window Corner Fabrication: 12-by-12-inch long, full-size window corner including full-size sections of extrusions with factory-applied color finish, weather stripping, and glazing.
- E. Test Reports: Submit material and product test reports showing compliance with Design Build requirements.

1.5 QUALITY ASSURANCE

- A. Fenestration Standard: Comply with AAMA/WDMA 101/I.S.2/NAFS, "North American Fenestration Standard Voluntary Performance Specification for Windows, Skylights and Glass Doors," for definitions and minimum standards of performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.
1. Provide AAMA-certified aluminum windows with an attached label.
- B. Source Limitations: Obtain aluminum windows through one source from a single manufacturer.
- C. Glazing Publications: Comply with published recommendations of glass manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Build mockup for type(s) of window(s) indicated, in location(s) shown on Drawings.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace aluminum windows which fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
 - c. Faulty operation of movable sash and hardware.
 - d. Deterioration of metals, other materials, and metal finishes beyond normal weathering.
 - e. Failure of insulating glass.
 2. Warranty Period:
 - a. Window: Three years from date of Substantial Completion.
 - b. Glazing: 10 years from date of Substantial Completion.
 - c. Metal Finish: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Sliding Windows:
 - a. EFCO.
 - b. Kawneer.
 - c. St. Cloud Window, Inc.
 - d. Wausau.
 - e. Approved equal.
 2. Soundproofed Windows:
 - a. Soundproof Windows, Inc.
 - b. Citi Quiet.
 - c. Approved equal.

2.2 MATERIALS

- A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength, not less than 16,000-psi minimum yield strength, and not less than 0.062-inch thickness at any location for the main frame and sash members.
- B. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum window members, trim, hardware, anchors, and other components.

1. Reinforcement: Where fasteners screw anchor into aluminum less than 0.125 inch thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, noncorrosive, pressed-in, splined grommet nuts.
 2. Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.
- C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
- D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
- E. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, nonshrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.
- F. Weather Stripping: Provide full-perimeter elastomeric weather stripping for each operable sash unless otherwise indicated. Weatherstripping shall be non-shrinking, resistant to ultraviolet degradation, and replaceable

2.3 WINDOWS

A. Sliding Window Units:

1. Basis of Design: Subject to compliance with requirements, provide "SCW 960 Series—Horizontal Rolling Windows", as manufactured by St. Cloud Window, Inc., or approved equal.
2. Frame: Aluminum extrusions, of size, thickness, and profile as indicated on the Drawings or standard with the selected product.
3. Hardware:
 - a. Lock: Meeting rails shall have a spring-loaded metal plunger type lock. Lock shall engage automatically as window is closed.
 - b. Sash Rollers: All sash rollers shall be made of Delrin material lubricated with "Moly B" dry lubricant operating on a stainless steel axle. Rollers shall be recessed into the bottom sash rail so as not to protrude beyond the sash extrusion or weather-strip.
4. Glazing: 1/4 inch glass thick consisting of two lites of 1/8 inch glass bonded to pvb interlayer. Refer to Division 8 Section "Glazing" for additional requirements.

B. Soundproofed Windows:

1. Basis of Design: Subject to compliance with requirements, provide soundproofed windows as manufactured by Soundproofed Windows, Inc., or approved equal.
2. Frame: Removable frame fabricated from aluminum extrusions, of size, thickness, and profile as indicated on the Drawings or standard with the selected product. Frame shall be equipped with spring-loaded seals.
3. Glazing: 1/4 inch glass thick consisting of two lites of 1/8 inch glass bonded to custom pvb interlayer designed for sound reduction.

C. Exterior Casement Windows:

1. Description: In-swing casement window constructed by replacing one of existing window lites, as indicated or selected by the Commissioner. Exterior aluminum frames and glass shall match the existing conditions for profile, material and finish.
2. Hardware: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum and of sufficient strength to perform the function for which it is intended.
 - a. Operators: Operating hardware shall be concealed in-swing 4-bar stainless steel arms at head and sill.
 - b. Hinges: AAMA 904; concealed four- or six-bar friction hinge located on each jamb near top rail; two per ventilator.
 - c. Lock: Multi-point locks manufactured from a white bronze alloy with a US25D brushed finish.
 - d. In-swinging casement windows shall contain stainless steel limiting arms with keyed releases for cleaning purposes
 - e. Limit Device: Concealed friction adjuster, adjustable stay bar or support arms with adjustable, limited, hold-open limit device; located on jamb of each ventilator.
 - 1) Provide Threaded grommets or other devices to prevent stripping.
 - f. Handle: Rotating handle, with powder coated painted finished.

2.4 FABRICATION

- A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
- B. Exterior Windows:
 1. Principal window frame and sash ventilator members shall be a minimum 0.125" in thickness at glazing legs, hardware mounting webs and section flanges.
 2. Extruded or formed trim components shall be a minimum 0.078" in thickness.
 3. Thermally Improved Construction: Fabricate aluminum windows with an integral, concealed, low-conductance thermal barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact.
 - a. Provide thermal-break construction that has been in use for not less than three years and has been tested to demonstrate resistance to thermal conductance and condensation and to show adequate strength and security of glass retention.
 - b. Provide thermal barriers tested according to AAMA 505; determine the allowable design shear flow per the appendix in AAMA 505.
 4. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior
- C. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units.

- D. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 8 Section "Glazing" and with AAMA/WDMA 101/I.S.2/NAFS.
- E. Glazing Stops: Provide snap-on glazing stops coordinated with Division 8 Section "Glazing" and glazing system indicated. Provide glazing stops to match sash and ventilator frames.

2.5 ALUMINUM FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. High-Performance Organic Finish (3-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coatings; Organic Coating: manufacturer's standard 3-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss: As selected by the Commissioner from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate, and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight window installation.
 - 1. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing windows, hardware, accessories, and other components.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
- C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.

- D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

END OF SECTION 085113

SECTION 087100 – DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide door hardware in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:
1. Swinging doors.
 2. Sliding Doors
 3. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
1. Mechanical door hardware.
 2. Electromechanical door hardware, power supplies, back-ups and surge protection.
 3. Automatic operators.
 4. Cylinders specified for doors in other sections.
- C. Related Sections:
1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
 2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
 3. Division 1 Section "Construction Waste Management".
 4. Division 1 Section "Construction IAQ Requirements".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 2. ANSI/SDI A250.13 - Testing and Rating of Severe Windstorm Resistant Components for Swing Door Assemblies.
 3. ASTM E1886 - Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Shutters Impacted by Missiles and Exposed to Cyclic Pressure Differentials.
 4. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure difference.
 5. ASTM E1996 - Standard specification for performance of exterior windows, curtain walls, doors and storm shutters impacted by Windborne Debris in Hurricanes.
 6. FEMA 361 2008 - Design and Construction Guidance for Community Safe Rooms.
 7. ICC 500 - ICC/NSSA Standard for the Design and Construction of Storm Shelters.
 8. ICC/IBC - International Building Code.
 9. NFPA 70 - National Electrical Code.
 10. NFPA 80 - Fire Doors and Windows.
 11. NFPA 101 - Life Safety Code.
 12. NFPA 105 - Installation of Smoke Door Assemblies.
 13. TAS-201-94 - Impact Test Procedures.
 14. TAS-202-94 - Criteria for Testing Impact and Non-Impact Resistant Building Envelope Components using Uniform Static Air Pressure.
 15. TAS-203-94 - Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.
 16. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards:

1. ANSI/BHMA Certified Product Standards - A156 Series
2. UL10C – Positive Pressure Fire Tests of Door Assemblies.

1.2 LEED BUILDING, GENERAL REQUIREMENTS

A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 SUBMITTALS

A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:

1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.

B. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

C. Shop Drawings: Details of electrified door hardware, indicating the following:

1. Wiring Diagrams: For power, signal, and control wiring and including the following:
 - a. Details of interface of electrified door hardware and building safety and security systems.
 - b. Schematic diagram of systems that interface with electrified door hardware.
 - c. Point-to-point wiring.
 - d. Risers.
 - e. Elevations doors controlled by electrified door hardware.
2. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.

- D. Samples for Initial Selection: For plastic protective trim units in each finish, color, and texture required for each type of trim unit indicated.
- E. Samples for Verification: For exposed door hardware of each type required, in each finish specified, prepared on Samples of size indicated below. Tag Samples with full description for coordination with the door hardware schedule. Submit Samples before, or concurrent with, submission of door hardware schedule.
1. Sample Size: Full-size units or minimum 2-by-4-inch Samples for sheet and 4-inch long Samples for other products.
 - a. Full-size Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.
- F. Other Action Submittals:
1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - a. Submittal Sequence: Submit door hardware schedule after or concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
 - b. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule." Double space entries, and number and date each page.
 - c. Content: Include the following information:
 - 1) Identification number, location, hand, fire rating, size, and material of each door and frame.
 - 2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - 3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
 - 4) Description of electrified door hardware sequences of operation and interfaces with other building control systems.
 - 5) Fastenings and other pertinent information.
 - 6) Explanation of abbreviations, symbols, and codes contained in schedule.
 - 7) Mounting locations for door hardware.
 - 8) List of related door devices specified in other Sections for each door and frame.
 2. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.
- G. Qualification Data: For Installer.
- H. Product Certificates: For electrified door hardware, from the manufacturer.

1. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.

I. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.

J. Warranty: Special warranty specified in this Section.

K. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to City of New York via registered mail or overnight package service. Instructions for delivery to the City of New York shall be established at the "Keying Conference".

1.5 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Related Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.6 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive City of New York of other rights City of New York may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the City of New York. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
 2. Faulty operation of the hardware.
 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 4. Electrical component defects and failures within the systems operation.
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods:
1. Ten years for mortise locks and latches.
 2. Ten years for manual door closers.
 3. Two years for electromechanical door hardware.

1.7 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for City of New York's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Continuing Service: Beginning at Substantial Completion, and running concurrent with the specified warranty period, provide continuous (6) months full maintenance including repair and replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door opening operation. Provide parts and supplies as used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
1. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
 - a. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
 2. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.
 - a. Permanent cylinders, cores, and keys to be installed by City of New York.

2.2 HANGING DEVICES

- A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles as specified in the Door Hardware Sets.
1. Quantity: Provide the following hinge quantity, unless otherwise indicated:

- a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing hinges unless Hardware Sets indicate heavy weight.
 4. Hinge Options: Comply with the following where indicated in the Hardware Sets or on Drawings:
 - a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:
 - 1) Out-swinging exterior doors.
 - 2) Out-swinging access controlled doors.
 5. Acceptable Manufacturers:
 - a. Hager Companies (HA).
 - b. McKinney Products (MK).
 - c. Stanley Hardware (ST).
 - d. Approved equal.
 6. Acceptable Manufacturers for Cam-lift Hinges:
 - a. Zero International.
 - b. IAC.
 - c. Approved equal.
- B. Coordinators: ANSI/BHMA A156.3 certified door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Coordinators fabricated from steel with nylon-coated strike plates and built-in adjustable safety release.
1. Acceptable Manufacturers:
 - a. Door Controls International (DC).
 - b. McKinney Architectural Hardware (MK).
 - c. Rockwood Manufacturing (RO).
 - d. Trimco (TC).
 - e. Approved equal.

2.3 CENTER-HUNG AND OFFSET PIVOTS

- A. Center-Hung and Offset Pivots: BHMA A156.4.
1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. DORMA Architectural Hardware; Member of The DORMA Group North America.
 - b. Rajack.
 - c. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
 - d. Approved equal.
- B. For number and quantity, refer to the Drawings.

2.4 CYLINDERS AND KEYING

- A. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.
- B. Cylinders: Original manufacturer cylinders complying with the following:
1. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
 2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 3. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
- C. Security Cylinders: ANSI/BHMA A156.5, Grade 1, patented security cylinders and keys able to be used together under the same facility master or grandmaster key system. Cylinders are to be factory keyed.
1. Basis of Design:
 - a. Schlage - Primus.
- D. Keying System: Each type of lock and cylinders to be factory keyed. Conduct specified "Keying Conference" to define and document keying system instructions and requirements. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by City of New York. Incorporate decisions made in keying conference, and as follows:
1. Master Key System: Cylinders are operated by a change key and a master key.
 2. Grand Master Key System: Cylinders are operated by a change key, a master key, and a grand master key.
 3. Great-Grand Master Key System: Cylinders are operated by a change key, a master key, a grand master key, and a great-grand master key.
 4. Existing System: Master key or grand master key locks to City of New York's existing system.
 5. Keyed Alike: Key all cylinders to same change key.
- E. Key Quantity: Provide the following minimum number of keys:
1. Top Master Key: One (1)
 2. Change Keys per Cylinder: Two (2)
 3. Master Keys (per Master Key Group): Two (2)

4. Grand Master Keys (per Grand Master Key Group): Two (2)
5. Construction Control Keys (where required): Two (2)
6. Permanent Control Keys (where required): Two (2)

- F. Construction Keying: Provide construction master keyed cylinders or temporary keyed construction cores where specified. Provide construction master keys in quantity as required by project Contractor. Replace construction cores with permanent cores. Furnish permanent cores for installation as directed under specified "Keying Conference".
- G. Key Registration List: Provide keying transcript list to City of New York's representative in the proper format for importing into key control software.

2.5 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified mortise locksets furnished in the functions as specified in the Hardware Sets. Locksets to be manufactured with a corrosion resistant, stamped 12 gauge minimum formed steel case and be field-reversible for handing without disassembly of the lock body. Lockset trim (including knobs, levers, escutcheons, roses) to be the product of a single manufacturer. Furnish with standard 2 3/4" backset, 3/4" throw anti-friction stainless steel latchbolt, and a full 1" throw stainless steel bolt for deadbolt functions.

1. Provide mortise lock bodies functionally compatible with a rose-less lever trim option.
2. Acceptable Manufacturers:

- a. Accurate Lock and Hardware (AC) – 9500 Series.
- b. Corbin Russwin Hardware (RU) – ML2000 Series.
- c. Sargent Manufacturing (SA) – 8200 Series.
- d. Approved equal.

- B. Lock Trim Design:

1. Acceptable Manufacturers
 - a. D line.
 - b. Corbin Russwin Hardware (RU)
 - c. Sargent Manufacturing (SA)
 - d. Approved equal.
2. Basis of Design: As shown on the Drawings.

2.6 CONVENTIONAL EXIT DEVICES

- A. All exit devices shall be certified to meet ANSI/BHMA A156.3 Grade 1 requirements and shall be listed by Underwriters Laboratories and bear the UL label for life safety in full compliance with NFPA 80 and NFPA 101. Crossbars must have minimum wall thickness of .062" with arms being counter balanced by springs in both center case and hinge style cases; springs shall be stainless steel. All crossbars, except at rated openings, shall be capable of being locked down by inside dogging feature accomplished by depressing crossbar and turning key.

- B. Basis of Design: Von Duprin 98 Series.

- C. Acceptable Manufacturers:

1. Sargent 80 Series

2. Corbin Russwin 5000 Series
3. Approved equal.

2.7 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
2. Standards: Closers to comply with UL-10C and UBC 7-2 for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1 provisions for door opening force and delayed action closing.
4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
 - a. Where closers are indicated to have mechanical dead-stop, provide heavy duty arms and brackets with an integral positive stop.
 - b. Where closers are indicated to have mechanical hold open, provide heavy duty units with an additional built-in mechanical holder assembly designed to hold open against normal wind and traffic conditions. Holder to be manually selectable to on-off position.
 - c. Where closers are indicated to have a cushion-type stop, provide heavy duty arms and brackets with spring stop mechanism to cushion door when opened to maximum degree.
5. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates, and through-bolt or security type fasteners as specified in the door Hardware Sets.
6. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units and high impact, non-corrosive plastic covers standard.
7. Acceptable Manufacturers:
 - a. Corbin Russwin Hardware (RU) - DC8000 Series.
 - b. LCN (LCN) - 4040 Series.
 - c. Norton Door Controls (NO) - 7500 Series.
 - d. Yale Locks and Hardware (YA) - 4400 Series.

2.8 CONCEALED FLOOR CLOSERS – HEAVYWEIGHT

- A. All overhead concealed closers shall be ANSI/BHMA 156.4 certified Grade 1 non-handed and shall be rack and pinion type. Concealed closers shall be offset or center hung as listed in the hardware sets and available with hold-open feature. Provide separate and independent valves

for closing speed, latch speed, and backcheck adjustments. Overhead concealed closers shall require a maximum 4-inch frame head for mounting.

B. Basis of Design: Rixson 5000 Series.

C. Acceptable Manufacturers

1. Dorma.
2. CRL
3. Approved equal.

2.9 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, design as scheduled with anchorage as indicated. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Acceptable Manufacturers:

- a. D-line.
- b. Hafele.
- c. Iron Mongery.
- d. Approved equal.

2.10 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and UBC 7-2, Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E 1408.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Acceptable Manufacturers:

1. Zero International.
2. Reese Enterprises.
3. Pemko Manufacturing (PE).
4. Approved equal.

2.11 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.12 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- D. Antimicrobial Finishes: Where specified, finishes on locksets, latchsets, exit devices and push/pull trim to incorporate an FDA recognized. Silver Ion, antimicrobial coating listed for use on equipment as a suppressant to the growth and spread of a broad range of bacteria, algae, fungus, mold and mildew.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify Commissioner of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Integrated Wiegand access control products are required to be installed through current members of the ASSA ABLOY "Certified Integrator" (CI) program.
- D. Power Operator products and accessories are required to be installed through current members of the manufacturer's "Power Operator Preferred Installer" program.
- E. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- F. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- G. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection: Supplier shall perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish, and provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of City of New York occupancy.

3.7 DEMONSTRATION

- A. Instruct City of New York's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SCHEDULE

- A. The hardware sets represent the design intent and direction of the City of New York and Commissioner. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the Commissioner with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
- B. Refer to the Hardware Schedule located on the Drawings for sets, hardware types, quantities, model numbers, hardware descriptions and finishes.

END OF SECTION 087100

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SECTION 088000 – GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide glazing in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Clear float glass.
2. Clear tempered glass.
3. Laminated glass, including units for sound rated assemblies.
4. Insulated glass.
5. Mirror glass.

- B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction Waste Management".
4. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 DEFINITIONS

- A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- D. Deterioration of Insulating Glass: Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass under normal use that is attributed to the manufacturing process. Failure excludes glass breakage and maintenance and cleaning of insulating glass contrary to manufacturer's written instructions.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
 - a. Design Loads: As required by the State of New York Building Code.
 - b. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or, whichever is less.
 - 1) For insulating glass.
- C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.5 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:
1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
 2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.

- B. **Product Data:** For each glass product and glazing material indicated, submit manufacturers technical information, installation instructions and performance criteria.
- C. **Samples:** For each glass type, in the form of 12 inch square Samples for glass. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
- D. **Product Certificates:** Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
- E. **Preconstruction Adhesion and Compatibility Test Report:** From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.
- F. **Product Test Reports:** For each of the following types of glazing products:
 - 1. Insulating glass.
 - 2. Glazing sealants.

1.6 QUALITY ASSURANCE

- A. **Installer Qualifications:** An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance.
- B. **Source Limitations for Glazing Accessories:** Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.
- C. **Safety Glazing Products:** Comply with testing requirements in 16 CFR 1201.
 - 1. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites:
 - a. More than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.
- D. **Glazing Publications:** Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: GANA's "Glazing Manual."
 - 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."
 - 3. Authorities having jurisdiction.
- E. **Insulating-Glass Certification Program:** Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:
 - 1. Insulating Glass Certification Council.
 - 2. Associated Laboratories, Inc.

F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups in the location as directed by Commissioner.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

G. Preinstallation Conference: Conduct conference at Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below.

1.9 WARRANTY

A. General: Submit warranties to repair or replace defective glass and glazing materials or workmanship for a period of not less than 5 years after date of Substantial Completion, or longer where specified.

B. Insulating Glass: Manufacturer's standard form, made out to City of New York and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article. Submit a written warranty agreeing to replace defective insulating glass for a period of 10 years after date of Substantial Completion. Defects include, but are not limited to the following:

1. Failure of insulating glass edge seal as shown by frost, moisture, dust or corrosion within sealed air space
2. Insulating glass spacer migration.
3. Failure to meet specified performance requirements.

C. Manufacturer's Warranty on Laminated Glass: Submit written warranty signed by insulating glass manufacturer agreeing to furnish replacements for those laminated glass units that deteriorate as defined in the "Definitions" article, f.o.b. point of manufacture, freight allowed Project site, within specified warranty period indicated below. Warranty covers only deterioration due to normal conditions of use and not to handling, installing, and cleaning practices contrary to glass manufacturer's published instructions.

1. Warranty Period: Manufacturer's standard but not less than 5 years after date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Guardian Industries Corp.
 2. Pilkington North America.
 3. PPG Industries, Inc.
 4. Viracon.
 5. Approved equal.

2.2 GLASS PRODUCTS

- A. Glass, General: All glass of the same type shall be the manufactured product of one company. Provide glass types for each application according to the glazing schedule found in part three of this section.
- B. Fabrication Process: By horizontal (roller-heat) process. Glass heat treatment should run in one direction as installed in the building. Direction is subject to Commissioner's approval.
1. Resulting heat treated glass shall minimize the "roller distortion" or "ripples" resulting from fabrication. Where noticeable distortions exist, and are acceptable to the Commissioner, install glass with such distortions running horizontally.
 2. Glass within one type of opening shall be produced by the same heat treating process.
- C. Clear Float Glass: ASTM C 1036; Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select).
1. Thickness: 1/4 inch, or as indicated on the Drawings.
- D. Uncoated Clear Heat-Treated Float Glass: ASTM C 1048; Condition A (uncoated surfaces), Type 1 (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), Kind FT (fully tempered).
1. Thickness: 1/4 inch, or as indicated on the Drawings.
- E. Laminated Glass:
1. Two lites of glass bonded to plastic, puncture resistant, 0.030" (minimum) polyvinyl butyral (PVB) interlayer conforming to the requirements of ANSI Z97.1, ASTM C 1172, and CPSC standard 16 CFR 1201 Category II.
 2. Interlayer shall be compatible with all glazing sealants.
 3. Thickness: 1/4 inch total.
 4. Types and Uses: Refer to Division 8 Section "Interior Aluminum Windows" for windows indicated to receive the following glazing types:
 - a. Sliding Glass Windows: 1/4 inch glass thick consisting of two lites of 1/8 inch glass bonded to pvb interlayer.

- b. Soundproofed Windows: 1/4 inch glass thick consisting of two lites of 1/8 inch glass bonded to pvb interlayer. Glazing shall be applied as secondary window units behind existing glass, separated by a 3 inch air space, creating a dual pane unit.
- F. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Section.
1. Provide Kind FT (fully tempered) glass lites where safety glass is indicated.
 2. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
 3. Sealing System: Dual seal, with primary and secondary sealants.
 4. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:
 - a. Spacer Material: Mill finish.
 - b. Desiccant: Molecular sieve or silica gel, or blend of both.
 - c. Corner Construction: Manufacturer's standard corner construction.
 5. Low-E Coated Glass Products: Clear monolithic glass with a high performance low-emissivity (low-E) coating for use in an insulating unit:
 - a. Low-E coating(s) shall be neutral in transmitted and otherwise exhibit the visual and performance characteristics of the products specified herein.
 - b. Visual quality control acceptance criteria of the coating shall be consistent with industry guidelines, subject to approval by the Contractor.
 6. Thickness: 1 inch insulated glass.
 - a. Subject to compliance with requirements, provide VE1-2M, as manufactured by Viracon, or approved equal, complying with the following:
 - 1) Exterior Lite: 1/4 inch clear glass with Low-E coating on the #2 surface. Provide VE-2M, by Viracon.
 - 2) Air Space: 1/2 inch.
 - 3) Interior Lite: 1/4 inch laminated glass consisting of two lites of clear glass, with a 0.030" (minimum) polyvinyl butyral (PVB) interlayer.
- G. Flat Glass Mirrors: Clear glass, complying with ASTM C 1503; Mirror Select Quality, with beveled and polished edges.
1. Nominal Thickness: 1/4 inch.
- H. Glass Schedule and Types: Refer to the Drawings and Material Schedule for glass products, descriptions, sizes, locations, patterns, and frames/trim (where applicable).
- 2.3 GLAZING ACCESSORIES
- A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
1. Neoprene complying with ASTM C 864.
 2. EPDM complying with ASTM C 864.

3. Silicone complying with ASTM C 1115.
 4. Thermoplastic polyolefin rubber complying with ASTM C 1115.
- B. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.
- C. Film Backing for Safety Mirrors: Film backing and pressure-sensitive adhesive; both compatible with mirror backing paint as certified by mirror manufacturer.

2.4 GLAZING SEALANTS AND SEALANT BACKING MATERIAL

- A. General: Provide products of type indicated, complying with the following requirements:
1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
- B. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800.
- C. Silicone Compounds, General: Where indicated provide silicone sealants which are specifically designed and tested for use as structural silicone sealant. Secondary seal or weatherseal silicone sealants shall be compatible with the neutral cure structural silicone sealant. Weatherseal shall accommodate a 50 percent increase or decrease of joint width as measured at time of application in accordance with ASTM C 719.
1. Single-Component: ASTM C 1193, Type S, Grade NS.
 2. Multi-Component: ASTM C 1193, Type M, Grade NS.
- D. Sealant Backing Materials: Preformed foam plastics and synthetic rubbers, compressible, non-gassing, non staining, and compatible with sealants and as recommended by sealant manufacturers. Backing shall be of the sizes and shapes to suit the various conditions and shall be a color different than the sealant color. Backer rods shall be 25 percent wider than the joint width.
1. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- E. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

2.5 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.6 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.
- C. Grind smooth and polish exposed glass edges and corners.
- D. Mirror Edge Treatment: Beveled and polished, unless otherwise indicated.
 - 1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.
 - 2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.
- E. Film-Backed Safety Mirrors: Apply film backing with adhesive coating over mirror backing paint as recommended in writing by film-backing manufacturer to produce a surface free of bubbles, blisters, and other imperfections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep system.
 - 3. Minimum required face or edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Provide glazing channel dimensions, to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than as follows:
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Install gaskets so they protrude past face of glazing stops.

3.5 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.6 MIRROR INSTALLATION

- A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
- B. Wall-Mounted Mirrors: Install mirrors with mastic and mirror angle trim. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.

1. Install mastic as follows:

- a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
 - b. After mastic is applied, align mirrors and press into place while maintaining a minimum air space of 1/8 inch between back of mirrors and mounting surface.
- C. Protect mirrors from breakage and contaminating substances resulting from construction operations.
 - D. Do not permit edges of mirrors to be exposed to standing water.
 - E. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

3.7 CLEANING AND PROTECTION

- A. Do not apply markers to glass surface unless required for certification purposes. Remove nonpermanent labels, and clean surfaces.

- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000

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SECTION 089000 – LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide louvers in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Fixed extruded-aluminum louvers, to match existing louvers at Base Building.

- B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction Waste Management".
4. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

1. Design Loads: As indicated on Drawings to match existing, but not less than 30 lbf/sq. ft.

- B. Thermal Movements: Provide louvers that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

- C. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

1.4 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:
1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
 2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.
- B. Product Data: For each type of product indicated, including hardware and accessories and finishing materials and processes. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
- C. Shop Drawings: For louvers and accessories, include plans, elevations, sections, details, and attachments to other Work. Show blade profiles, angles, and spacing.
1. For installed louvers indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Samples: Submit samples for verification purposes of each type of metal finish required, prepared on 6 inch square metal samples of same thickness and alloy indicated for final unit of Work. Where finishes involve normal color and texture variations, include sample sets showing full range of variations expected.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.
- F. Certificates: Submit product certificates signed by louver manufacturers certifying that their products which comply with Project requirements are licensed to bear AMCA Seal based on tests made in accordance with AMCA Standard 500 and complying with AMCA Certified Ratings Program.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain louvers through one source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

- B. **Welding Qualifications:** Qualify welding processes and welding operators in accordance with D1.2 "Structural Welding Code - Aluminum" and D1.3 "Structural Welding Code - Sheet Steel."
1. Certify that each welder employed in unit of Work of this section has satisfactorily passed AS qualification tests for welding processes involved and, if pertinent, has undergone re-certification.
 2. Testing for re-certification is Contractor's responsibility.
- C. **SMACNA Standard:** Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.
- D. **Engineer Qualifications:** Professional engineer licensed in the State of New York and experienced in providing engineering services of the kind indicated which has resulted in the successful installation of louvers similar in material, design, and extent to that indicated for this Project.
- 1.6 **PROJECT CONDITIONS**
- A. **Field Measurements:** Verify louver openings by field measurements before fabrication and indicate measurements on Shop Drawings.
1. **Established Dimensions:** Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating louvers without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Available Manufacturers:** Subject to compliance with requirements, provide louvers as manufactured by one of the following:
1. Airolite Company, LLC (The).
 2. Construction Specialties, Inc.
 3. Greenheck Fan Corporation.
 4. Approved equal.

2.2 MATERIALS

- A. **Aluminum Extrusions:** ASTM B 221; Alloy 6063-T5, T-52, or T6.
- B. **Aluminum Sheet:** ASTM B 209, alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. **Aluminum Castings:** ASTM B 26, alloy 319.
- D. **Fasteners:** Of same basic metal and alloy as fastened metal or 300 Series stainless steel, unless otherwise indicated. Do not use metals that are incompatible with joined materials.
1. Use types and sizes to suit unit installation conditions.
 2. Use Phillips flat-head screws for exposed fasteners, unless otherwise indicated.

- E. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.3 FABRICATION, GENERAL

- A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.
- C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
 - 1. Frame Type: Channel, unless otherwise indicated.
- D. Include supports, anchorages, and accessories required for complete assembly.
- E. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer, or 72 inches o.c., whichever is less.
 - 1. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.
 - 2. Exterior Corners: Prefabricated corner units with mitered and welded blades and with fully recessed mullions at corners.
- F. Where indicated, provide subsills made of same material as louvers or extended sills for recessed louvers.
- G. Join frame members to each other and to fixed louver blades with fillet welds, threaded fasteners, or both as standard with louver manufacturer, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.4 EXTRUDED-ALUMINUM LOUVERS

- A. Basis of Design: Subject to compliance with requirements, provide Model K605D as manufactured by Airolite Company, LLC, or approved equal.
 - 1. Louvers shall match existing louvers at Base Building.
- B. Horizontal Drainable Sightproof Fixed Blade Louvers: Extruded aluminum frames and sightproof louver blades designed to collect and drain water to exterior at sill by means of gutters in front edges of blades and of channels in jambs and mullions; complying with the following requirements:
 - 1. Description:

- a. Louver Depth: 5 inches.
 - b. Frame and Blade Nominal Thickness: 0.081 inch.
 - c. Louver Blade Profile: Horizontal, inverted-V type.
2. Louver Performance Ratings:
- a. Free Area: 57%.
 - b. Air Performance: Not more than 0.40-inch H₂O static pressure drop at 1134-fpm free-area intake velocity.
 - c. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.5 LOUVER SCREENS

- A. General: Provide each exterior louver with louver screens complying with the following requirements:
1. Screen Location for Fixed Louvers: Interior face, unless otherwise indicated.
 2. Screening Type: Bird screening and insect screening where indicated.
- B. Secure screens to louver frames with stainless steel machine screws, spaced at each corner and at 12 inch o.c. between.
- C. Louver Screen Frames: Fabricate screen frames with mitered corners to louver sizes indicated and to comply with the following requirements:
1. Metal: Same kind and form of metal as indicated for louver frames to which screens are attached.
 - a. Reinforce extruded aluminum screen frames at corners with clips.
 2. Finish: Same finish as louver frames to which louver screens are attached.
 3. Type: Rewireable frames with a driven spline or insert for securing screen mesh.
- D. Louver Screening for Aluminum Louvers: Fit aluminum louver screen frames with screening covering louver openings and complying with the following requirements:
1. Bird Screening: 1/2 inch square mesh formed with 0.063 inch diameter aluminum wire.
 2. Insect Screening: 18 x 16 mesh formed with 0.012 inch diameter aluminum wire.

2.6 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish louvers after assembly.

2.7 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.
- B. High-Performance Organic Finish: 2-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by the Commissioner from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

- A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.
- F. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.
- G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where required by design or manufacturer's recommendations. Comply with Division 7 Section "Joint Sealants" for sealants applied during louver installation.
 1. Install gaskets for louver screens in accordance with gasket manufacturer's instructions and recommendations; to allow for removal or replacement of screens.

3.4 ADJUSTING AND CLEANING

- A. Clean exposed surfaces of louvers that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Commissioner, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089000

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SECTION 092900 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Gypsum board wall, ceiling and shaft-wall applications screw-attached to steel systems.
2. Non-load-bearing steel framing systems for interior gypsum board and shaft wall assemblies.
3. Suspension systems for interior gypsum ceilings.
4. Drywall finishing with joint tape-and-compound.
5. Tile backing panels.
6. Acoustical insulation and sealant for gypsum board products.

B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Requirements: Provide gypsum board assemblies capable of withstanding following lateral design loadings (air pressures) for maximum heights of partitions without failing. Evidence of failure includes deflections exceeding limits indicated, bending stresses causing studs to break or to distort, and end-reaction shear causing track (runners) to bend or to shear and studs to become crippled. Comply with requirements of governing authorities having jurisdiction and recommendations of SA923 of United States Gypsum Company for loading performance criteria.

1. Lateral Loading: 5 psf.
2. Deflection Limits, Painted Assemblies: 1/240 of partition height.
3. Deflection Limits for framed Tile and Other Hard Finish Surfaces: 1/360 of partition height.

1.4 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:

1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
 2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.
- B. Product Data: Submit manufacturer's specifications and installation instructions for materials for gypsum drywall and backer board. Submit other data as required to show compliance with these specifications.
- C. Samples: Full-size Sample in 12 inch long length for each trim accessory indicated.
- D. Product Certificates: Submit manufacturer's certificates showing compliance with performance requirements for each type of gypsum board product from manufacturer.
- E. Maintenance Data: Submit manufacturer's maintenance instructions or recommendations for gypsum board products to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Gypsum Board Terminology Standard: GA-505 by Gypsum Association.
- B. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
1. Provide gypsum board products designed to achieve fire ratings indicated on the Drawings.
- C. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

- B. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 2. Protective Coating: ASTM A 653, G60, hot-dip galvanized unless otherwise indicated.
- B. Studs and Runners: ASTM C 645.
1. Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: Minimum 0.030 inch for interior partitions.
 - b. Depth: As indicated on the Drawings.
- C. Slip-Type Head Joints: Where indicated, provide one of the following:
1. Single Long-Leg Runner System: ASTM C 645 top runner with 2 inch deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
 2. Double-Runner System: ASTM C 645 top runners, inside runner with 2 inch deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
 3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- D. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Metal Thickness: 0.030.
- F. Cold-Rolled Channel Bridging: Steel, 0.053-inch minimum base-metal thickness, with minimum 1/2 inch wide flanges.
1. Depth: As indicated on the Drawings.
 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch thick, galvanized steel.

- G. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 - 1. Minimum Base-Metal Thickness: 0.030 inch.
 - 2. Depth: As indicated on the Drawings.
- H. Resilient Furring Channels: 1/2 inch deep, steel sheet members designed to reduce sound transmission.
 - 1. Configuration: Asymmetrical or hat shaped.
- I. Cold-Rolled Furring Channels: 0.053 inch uncoated-steel thickness, with minimum 1/2 inch wide flanges.
 - 1. Depth: As indicated on the Drawings.
 - 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.030 inch.
 - 3. Tie Wire: ASTM A 641, Class 1 zinc coating, soft temper, 0.062 inch diameter wire, or double strand of 0.048 inch diameter wire.
- J. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.030, and depth required to fit insulation thickness indicated.

2.2 SHAFT WALL FRAMING

- A. Shaft Wall Studs: Provide "CH Studs" as manufactured by US Gypsum Company, or approved equal for repetitive members, corner and end members, and fire-resistance-rated assembly indicated.
 - 1. Minimum Base-Metal Thickness: 0.030 inch.
 - 2. Depth: 2-1/2 inches, minimum, or as indicated on the Drawings.
- B. Jamb Struts: Manufacturer's standard J-profile strut with long-leg length of 3 inches, in depth matching studs, and not less than 0.030 inch thick.
- C. Runner Tracks: Manufacturer's standard J-profile track with long-leg length as standard with manufacturer, but at least 2 inches long and in depth matching studs.
 - 1. Minimum Base-Metal Thickness: 0.030 inch.

2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641, Class 1 zinc coating, soft temper, 0.062 inch diameter wire, or double strand of 0.048-inch diameter wire.
- B. Hanger Attachments to Concrete:
 - 1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
 - a. Type: Cast-in-place or post-installed anchors, designed for attachment to concrete forms.

2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.
- C. Wire Hangers: ASTM A 641, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- D. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated; or as shown on the Drawings.
- E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.035 inch and minimum 1/2-inch wide flanges, with ASTM A 653, G60, hot-dip galvanized zinc coating.
1. Depth: As indicated on the Drawings.
- F. Main Runners: Carrying channels fabricated from cold rolled steel with rust inhibitive paint finish. Size shall be 1-1/2" deep, weighing 475 lbs/1000 l.f., for a hanger spacing of 4'-0" on center. Clips for attachment of hangers to carrying channels shall comply with seismic design requirements.
- G. Furring Channels (Furring Members):
1. Cold-Rolled Channels: 0.030-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
 2. Steel Studs and Runners: ASTM C 645.
 - a. Minimum Base-Metal Thickness: 0.030 inch.
 - b. Depth: As indicated on the Drawings.
 3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
 - a. Minimum Base-Metal Thickness: 0.030 inch.
 4. Resilient Furring Channels: 1/2 inch deep members designed to reduce sound transmission.
 - a. Configuration: Asymmetrical or hat shaped.

2.4 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Georgia-Pacific Gypsum LLC.
 2. National Gypsum Company.
 3. USG Corporation.
 4. Approved equal.
- B. Gypsum Board, Type X: ASTM C 1396.
1. Thickness: 5/8 inch.
 2. Long Edges: Tapered.
- C. Gypsum Liner Panel (for Shaft Walls): Comply with ASTM C 442.

1. Type X: Manufacturer's proprietary liner panels with moisture-resistant paper faces.
 - a. Core: 1 inch thick.
 - b. Long Edges: Double bevel.

2.5 BACKING PANELS

- A. Cementitious Backer Units (for Tile Substrates): ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. CertainTeed Corp.; FiberCement BackerBoard.
 - b. Custom Building Products; Wonderboard.
 - c. National Gypsum Company, Permabase Cement Board.
 - d. USG Corporation; DUROCK Cement Board.
 - e. Approved equal.
2. Thickness: 1/2 inch, or as indicated.

2.6 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges.

- B. Exterior Trim: ASTM C 1047.

1. Material: Hot-dip galvanized steel sheet, plastic, or rolled zinc.
2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

- C. Aluminum Trim: Extruded reveals, base, moldings and accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fry Reglet Corp.
 - b. Gordon, Inc.
 - c. Pittcon Industries.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
3. Finish: Factory primed, for field painted finish to match drywall. Refer to Division 9 Section "Painting".
4. Refer to the Drawings and Material Schedule for materials and products.

2.7 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound:

1. Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - a. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Tile Backing Panels: As recommended by backer unit manufacturer.

2.8 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Owens Corning.
- b. Roxul Inc.

- c. Thermafiber.
- E. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Pecora Corporation; AC-20 FTR.
 - b. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
 - c. USG Corporation; SHEETROCK Acoustical Sealant.
- F. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 FRAMING INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Stud Spacing: 16 o.c., unless otherwise indicated
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 - 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- E. Direct Furring:
 - 1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- F. Z-Furring Members:
 - 1. Erect insulation vertically and hold in place with Z-furring members spaced 24 inches o.c.
 - 2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
 - 3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.
- G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 - 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 5. Do not attach hangers to steel roof deck or permanent metal. Furnish cast-in-place hanger inserts that extend through forms.
 - 6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 - 7. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.6 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc., except in chases braced internally).
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4 to 3/8 inch wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4 to 1/2 inch wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.7 APPLYING INTERIOR GYPSUM BOARD

- A. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 - 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 - 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

B. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.8 APPLYING TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.
- B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.9 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
 1. Trim: Install each type of trim in locations indicated on the Drawings.
- B. Control Joints: Install control joints in accordance with ASTM C 840 and at locations indicated on the Drawings or approved by the Commissioner for visual effect.

3.10 INSTALLATION OF GYPSUM BOARD SHAFT-WALL ASSEMBLIES

- A. General: Install gypsum board shaft-wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and the following:
 1. ASTM C 754 for installing steel framing except comply with framing spacing indicated.
- B. Do not bridge architectural or building expansion joints with shaft-wall assemblies; frame both sides of expansion joints with furring and other support.
- C. Install supplementary framing in gypsum board shaft-wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, and similar items that cannot be supported directly by shaft-wall assembly framing.

- D. At penetrations in shaft wall, maintain fire-resistance rating of shaft-wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, and similar items.
- E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.
- F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
- G. Control Joints: Install control joints at locations indicated on Drawings, while maintaining fire-resistance rating of gypsum board shaft-wall assemblies.
- H. Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly. Install acoustical sealant to withstand dislocation by air-pressure differential between shaft and external spaces; maintain an airtight and smoke-tight seal; and comply with ASTM C 919 requirements or with manufacturer's written instructions, whichever are more stringent.
- I. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.11 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Ceiling plenum areas and concealed areas.
 - 2. Level 2: Panels indicated as substrates for other surface finishes.
 - a. Primer and its application to surfaces are specified in other Division 9 Sections.
 - 3. Level 4: At panel surfaces that are exposed to view.
 - a. Primer and its application to surfaces are specified in other Division 9 Sections
 - 4. Level 5: At panel surfaces indicated.
- E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.12 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093100 - TILING

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide tiling in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Ceramic mosaic floor tile.
2. Ceramic mosaic wall tile.
3. Sound control floor underlayment.

- B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction Waste Requirements".
4. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:

1. Level Surfaces: Minimum 0.6.

1.4 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:

1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.

4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.
- B. Product Data: For each type of tile, setting material, and accessory product indicated, submit manufacturer's technical data, color charts, and installation instructions.
- C. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- D. Samples: Submit the following:
1. Full-size units of each type and composition of tile and for each color and finish required.
 2. Assembled samples with grouted joints for each type and composition of tile and for each color and finish required, at least 12 inches square and mounted on rigid panel. Use grout of type and in color or colors approved for completed work.
 3. Full-size units of each type of trim and ceramic accessory.
 4. Stone thresholds in 6-inch lengths.
 5. 6 inch square sample of sound control floor underlayment.
- E. Product Certificates: Submit certificates, signed by product manufacturer, showing compliance with requirements.
- 1.5 QUALITY ASSURANCE
- A. Tile Manufacturing Standard: As applicable, furnish tile complying with the requirements of ANSI A137.1 for Standard Grade.
- B. Installer Qualifications: Engage an experienced Installer who has successfully completed in the past three years tile installations similar in material, design, and extent to that indicated for Project.
- C. Source Limitations: Obtain all tile of same type and color or finish from one source or producer.
1. Tile: Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.
 2. Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.
- D. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
1. Build mockup of each type of floor tile installation.
 2. Build mockup of each type of wall tile installation.
 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Preinstallation Conference: Conduct conference at Project site.

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Store liquid latexes and emulsion adhesives in unopened containers and protected from freezing.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
 1. Provide tile complying with Standard grade requirements.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced for setting and grouting, and ANSI standards referenced by TCA installation methods.
- C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
 1. Match the Commissioner's approved samples.
- D. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

- E. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer.
 - 1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

2.2 CERAMIC TILE MATERIALS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. American Olean; Division of Dal-Tile International Inc.
 - 2. Crossville, Inc.
 - 3. Daltile
- B. Ceramic Mosaic Floor and Wall Tile: Unglazed ceramic mosaic tile, 1 inch squares, on prepared sheets.
 - 1. Basis of Design: Subject to compliance with requirements, provide ceramic mosaic tiles as manufactured by American Olean, or approved equal.
 - a. Colors: Refer to the Drawings and Material Schedule for colors.
- C. Trim Units: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes:
 - 1. Base: Straight, module size as indicated.
 - 2. External Corners: Surface bullnose.
 - 3. Internal Corners: Field-buttet square corners except with coved base and cap angle pieces designed to fit with stretcher shapes.

2.3 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
 - 1. Bevel edges at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/2 inch or less, and finish bevel to match face of threshold.
 - 2. Description: Match Commissioner's approved samples.
- B. Thresholds: Marble, ASTM C 503; of type, size, finish as indicated the Drawings or as selected by the Commissioner.

2.4 BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9. Refer to Division 9 Section "Gypsum Board Assemblies" for materials and performance requirements.

2.5 SETTING AND GROUTING MATERIALS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Bostik.
 2. LATICRETE International Inc.
 3. MAPEI Corporation.
 4. Approved equal.
- B. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4, consisting of the following:
1. Prepackaged dry-mortar mix containing dry, redispersible, ethylene vinyl acetate additive to which only water must be added at Project site.
 - a. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.
- C. Latex-Portland Cement Grout: ANSI A118.6, Latex additive (water emulsion) serving as a replacement for part or all of gauging water, added at job site to prepackaged dry grout mix.
- D. Sand-Portland Cement Grout: ANSI A108.10, composed of white or gray cement and white or colored aggregate as required to produce color indicated by the Commissioner.
1. Use unsanded grout mixture for joints 1/8 and narrower.
 2. Use sanded grout mixture for joints wider than 1/8.

2.6 WATERPROOF MEMBRANES

- A. General: Manufacturer's standard product consisting of liquid-latex rubber and fabric reinforcement; complying with ANSI A118.10 and is recommended by the manufacturer for the application indicated.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Custom Building Products.
 2. Laticrete International, Inc.
 3. MAPEI Corporation.
 4. Approved equal.

2.7 SOUND CONTROL UNDERLAYMENT

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following
1. Sound Seal; CeraZorb.
 2. Kinetics Noise Control.
 3. Approved equal.
- B. Sound Control Underlayment: Sound reducing underlayment consisting of impact-absorbing materials. Delta Impact Insulation Class (Delta IIC) of 20 when tested according to ASTM E 492; with a 6 inch thick concrete slab.
1. Material: As indicated based on products selected by the Commissioner.
 2. Thickness: As required to meet acoustic performance criteria indicated on the Drawings.

2.8 ELASTOMERIC SEALANTS

- A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements of Division 7 Section "Joint Sealants", including ASTM C 920 as referenced by Type, Grade, Class, and Uses.
- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints.

2.9 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- C. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints that does not change color or appearance of grout.

2.10 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

3.2 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.
- B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.

1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
 - a. Tile floors in wet areas.
- C. Jointing Pattern: Lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls, and trim are same size.
 1. Joint Widths: Install tile with joint widths of 1/16 inch
- D. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 1. Locate joints in tile surfaces directly above joints in concrete substrates.
 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

3.3 WATERPROOFING MEMBRANE INSTALLATION

- A. Install waterproofing to comply with ANSI A108.13 and waterproofing manufacturer's written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate.
- B. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.4 SOUND CONTROL UNDERLAYMENT

- A. General: Install over completed membrane waterproofing system, in accordance with manufacturer's written instructions.
- B. Provide resilient perimeter joint at all intersections of floor with wall and structure.

3.5 FLOOR TILE INSTALLATION

- A. Ceramic Floor Tile: Install ceramic tile to comply with requirements indicated below for setting bed methods, TCA installation methods related to types of subfloor construction, and grout.
 1. Latex-Portland Cement Mortar: ANSI A108.5.
 - a. Latex-Portland Cement (thinset), Interior: TCA F113, MODIFIED for acoustical underlayment.
 - b. Grout: Latex-portland cement grout (use sanded grout for joints greater than 1/8 inch.
 2. Latex-Portland Cement Mortar, ANSI A108.10 and 108.13 (for waterproof membrane).
 - a. Latex-Portland Cement (Thinset), Interior: TCA F122; with waterproof membrane, MODIFIED for acoustical underlayment.
 - b. Grout: Latex-portland cement grout (use sanded grout for joints greater than 1/8 inch.
- B. Stone Thresholds: TCA TR611; install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.

1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.

3.6 WALL TILE INSTALLATION

- A. Wall Tile: Install types of wall tile indicated below for setting-bed methods, and TCA installation methods related to subsurface and grout.

1. Latex-Portland Cement Mortar: ANSI A108.5 (ANSI A108.11 for cementitious backer units).
 - a. Cement Backer Board, Interior: TCA W244.
 - b. Cement grout.
2. Latex-Portland Cement Mortar: ANSI A108.5.
 - a. Glass Mat or Water-resistant Gypsum/Backer Board, Interior: TCA W245.
 - b. Cement grout.

END OF SECTION 093100

SECTION 095425 – WOOD CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide plywood ceilings in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Plywood ceilings with painted finish.
2. Suspension system, vibration isolators, and other accessories.

B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction Waste Management".
4. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 SUBMITTALS

A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:

1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.

- B. **Product Data:** For each type of product indicated, submit manufacturer's technical data for each type of wood ceiling unit and suspension system required.
1. **Fire-Retardant Materials:** Include manufacturer's instructions for handling, storing and installation of fire-retardant treated wood.
- C. **Coordination Drawings:** Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
1. Ceiling suspension system members.
 2. Method of attaching hangers to building structure.
 - a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
 3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 4. Minimum Drawing Scale: 1/4 inch = 1 foot.
- D. **Shop Drawings:**
1. Include plans, elevations, sections, and mounting devices and details.
 2. Include details at joints and corners; and details at ceiling intersections and intersections with walls. Indicate panel edge.
- E. **Calculations:** Submit load and deflection calculations for resiliently hung plywood ceilings determined by loading requirements and isolator spacing. Coordinate with shop drawings.
- F. **Samples for Initial Selection:** Manufacturer's color charts consisting of actual wood ceiling planks or sections of wood ceiling planks, suspension systems, and moldings showing the full range of colors, textures, and patterns available for each type of ceiling assembly indicated.
- G. **Samples for Verification:** For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
1. **Wood Ceiling:** Set of 6-inch square Samples of each type, color, pattern, and texture.
 2. **Exposed Suspension System Members, Moldings, and Trim:** Set of 12-inch long Samples of each type, finish, and color.
- H. **Product Test Reports:** Based on evaluation of comprehensive tests performed by a qualified testing agency, for each wood ceiling plank.
- I. **Quality Certification:** Submit manufacturer's (fabricator's) certification, stating that the fabricated work complies with quality grades and other requirements indicated
- J. **Research/Evaluation Reports:** For each acoustical panel ceiling and components and anchor and fastener type.
- K. **Maintenance Data:** Submit manufacturer's maintenance instructions or recommendations for acoustical panel ceiling to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has successfully completed in the past three years wood ceiling installations similar in material, design, and extent to that indicated for Project
- B. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory, with the experience and capability to conduct the testing indicated. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.
- C. Single Source Responsibility: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.
- D. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
 - 1. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:
 - a. Smoke-Developed Index: 450 or less.
- E. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials, fabrication, and installation.
 - 1. Build mockup of typical ceiling area as shown on Drawings or as directed by the Commissioner. Include intersection of wall and ceiling, corners, and perimeters.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Commissioner specifically approves such deviations in writing.
- F. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wood ceiling units in original, unopened packages and store them where they will be protected against damage from moisture, direct sunlight, surface contamination or other causes.
- B. Before installing wood ceiling units, permit them to reach room temperature and a stabilized moisture content.
- C. Handle wood ceiling units carefully to avoid damage to edges and faces in any way.

1.6 PROJECT CONDITIONS

- A. Do not install wood ceiling systems until space is enclosed and wet-work in space is completed and nominally dry, work above ceilings completed.
- B. Conditioning: Installer shall advise Contractor of temperature and humidity requirements for wood ceiling installation areas. Do not install wood ceilings until required temperature and relative humidity have been stabilized and will be maintained in installation areas.

- C. Maintain temperature and humidity as required to maintain moisture content of installed ceilings within 1.0 percent of optimum moisture content, from date of installation through remainder of construction period. The fabricator of ceilings shall determine optimum moisture content and required temperature and humidity.

1.7 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, and partition assemblies.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Wood Ceiling Planks: Full-size panels equal to 2.0 percent of quantity installed.
 - 2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 BASIC MATERIALS AND FABRICATION METHODS

- A. Plywood Ceiling Panels: DOC PS 1, Exterior, AC, fire-retardant treated, 3/4-inch nominal thickness.
 - 1. Fabricate wood ceilings to dimensions, profiles, and details indicated with precut openings, where possible.
- B. Complete fabrication, assembly, finishing, and other work before shipment to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary, provide ample allowance for scribing, trimming, and fitting.
- C. Pre-Cut Openings: Provide wood ceilings with pre-cut openings, where possible, for HVAC and electrical work, and similar items. Locate openings accurately and provide proper size and shape. Smooth edges of cutouts and seal edges of cutouts with coating as recommended by the manufacturer.
- D. Fire Retardant Treatment:
 - 1. Provide fire-retardant treated lumber and plywood which comply with applicable AWPA standards for pressure impregnation with fire-retardant chemicals and with the following requirements.
 - a. Flame spread, fuel contribution and smoke developed ratings of 25 or less, with no increase in flame spread and no evidence of significant progressive combustion upon continuation of test for additional 20 minutes.
 - b. Use fire-retardant treatment which is relatively insoluble in water, will not adversely affect finishes indicated, and permits milling of lumber after treatment and kiln drying by a plant certified by UL.
 - c. Kiln-dry treated materials to required moisture content after treatment. Do not use twisted, warped, bowed or otherwise damaged or defective wood.

2.2 WOOD PANEL CEILING ASSEMBLY

- A. Furnish and erect wood panels ceilings consisting of 2 layers of 3/4 inch thick plywood, secured to metal framing, vibration isolators, and spring hangers.
1. Size: As indicated on the Drawings and Material Schedule.
 2. Finish: Field painted, matte black, to match the Commissioners samples.

2.3 METAL FRAMING AND SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements and New York City Building Code requirements.
- B. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Indirect Hung," unless otherwise indicated. Comply with seismic design requirements.
1. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.
 2. Concrete Anchors: Anchors of type indicated below, fabricated from corrosion-resistant materials, with holes or loops for attachment of hangers of type indicated and with capability to sustain, without failure, a load equal to 5 times that imposed by ceiling construction, as determined by testing per ASTM E 488, conducted by a qualified independent testing laboratory.
 - a. Cast-in-place anchors.
 - b. Chemical anchors.
 - c. Expansion anchors.
- C. Tie Wires: Wire ties, 9 gage, with paint or zinc coating.
- D. Hanger Rods and Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch-thick, galvanized steel sheet complying with ASTM A 653, G90 coating designation; with bolted connections and 5/16-inch-diameter bolts.
- F. Carrying Channels: Cold-rolled, commercial-steel sheet with a base metal thickness of 0.0538 inch, a minimum 1/2-inch-wide flange, with ASTM A 653, G60, hot-dip galvanized zinc coating.
1. Main Runners: Carrying channels fabricated from cold rolled steel with rust inhibitive paint finish. Size shall be 1-1/2" deep, weighing 475 lbs/1000 l.f., for a hanger spacing of 4'-0" on center. Clips for attachment of hangers to carrying channels shall comply with seismic design requirements.
- G. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Minimum Base-Metal Thickness: 0.030 inch.
 2. Depth: 7/8 inch, or as indicated on the Drawings.
- H. Acoustical Isolators: Provide elastomeric stabilized, spring hung vibration isolation devices for acoustically rated ceiling assemblies.

1. Provide 1/2" static deflection spring hangers, as indicated on the Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination: Furnish layouts for inserts or other supports to be installed by other trades for support of wood ceilings. Furnish concrete inserts in advance of time needed.
- B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install materials in accordance with manufacturer's printed instructions, and CISCA standards applicable to work. Install wood ceiling units with grain pattern running in one direction, unless otherwise indicated.
- B. Suspend ceiling hangers from building's structural members and as follows:
 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 4. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures
 5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 6. Do not attach hangers to steel deck tabs or roof deck. Attach hangers to structural members.
 7. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 200 mm from ends of each member.
 8. Acoustical rated assemblies: Provide vibration isolation hanger devices, installed in accordance with manufacturer's instructions, to provide required STC performance.

- C. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - D. Install hangers plumb and free from other objects within ceiling plenum. Splay hangers to miss obstructions and offset resulting horizontal force by bracing or other equally effective means.
 - E. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
 - F. Install edge moldings at perimeter of wood ceiling area and where necessary to conceal edges of wood units. Make tight, flush and aligned connections between exposed members.
 - G. Install wood ceiling units in coordination with suspension system. Fit adjoining units to form flush, tight joints. Scribe and cut for accurate fit at borders and around penetrating work.
- 3.4 ADJUSTMENT, CLEANING, FINISHING AND PROTECTION
- A. Repair damaged and defective wood ceilings wherever possible to eliminate defects, functionally and visually; where not possible to repair properly, replace work. Adjust joinery for uniform appearance.
 - B. Clean and make final adjustments.
 - C. Clean wood ceilings on exposed and semi-exposed surfaces. Touch-up shop applied finishes to restore damaged or soiled areas.
 - D. Protect wood veneer ceilings during remainder of construction period to ensure that work will be without damage or deterioration at time of acceptance.

END OF SECTION 095425

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SECTION 096440 – SPRUNG WOOD FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Tempered hardboard floor surfacing.
2. Plywood subfloor.
3. Wood floor supports.

B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 SUBMITTALS

A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:

1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.

B. Product Data: For each type of product indicated, submit manufacturer's specifications and instructions for wood flooring, including installation, storage, and finishing recommendations.

- C. Shop Drawings: For each type of floor assembly and accessory, include plans, elevations, sections, details, and attachments to other work. Include expansion provisions and trim details.
- D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors and finishes available for wood floor surfacing.
- E. Samples for Verification: For type of wood floor surfacing and accessory, with stain color and finish required, approximately 12 inches long and of same thickness and material indicated for the Work and showing the full range of normal color and texture variations expected.

1.4 QUALITY ASSURANCE

- A. Build mockup of typical flooring area as shown on Drawings.
 - 1. To set quality standards for sanding and application of field finishes, prepare finish mockup of floor area as shown on Drawings.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Commissioner specifically approves such deviations in writing.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wood floor surfacing materials in unopened cartons or bundles.
- B. Protect wood floor surfacing materials from exposure to moisture. Do not deliver wood flooring materials until after concrete, masonry, plaster, ceramic tile, and similar wet work is complete and dry.
- C. Store wood floor surfacing materials in a dry, warm, ventilated, weathertight location.

1.6 PROJECT CONDITIONS

- A. Conditioning period begins not less than seven days before wood floor surfacing installation, is continuous through installation, and continues not less than seven days after wood flooring installation.
 - 1. Environmental Conditioning: Maintain an ambient temperature between 65 and 75 deg F and relative humidity planned for building occupants in spaces to receive wood floor surfacing during the conditioning period.
 - 2. Wood Flooring Conditioning: Move wood floor surfacing into spaces where it will be installed, no later than the beginning of the conditioning period.
 - a. Do not install flooring until it adjusts to relative humidity of, and is at same temperature as, space where it is to be installed.
 - b. Open sealed packages to allow wood floor surfacing to acclimatize immediately on moving flooring into spaces in which it will be installed.
- B. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.
- C. Install factory-finished wood floor surfacing materials after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Hardboard Wood Floor Surfacing: Equal to 1 percent of amount installed for each type of wood flooring indicated.

PART 2 - PRODUCTS

2.1 HARDBOARD FLOORING

- A. Available Manufacturers: Subject to compliance with requirements, provide wood floor surfacing as manufactured by one of the following:
1. D & M Lumber Products Co., Inc.
 2. Georgia Pacific.
 3. U.S. Lumber.
 4. Approved equal.
- B. Wood Floor Surfacing: Provide tempered hardboard floor on two layers of plywood, at locations indicated on the Drawings.
1. Tempered Hardboard Paneling: Class 1, S1S, tempered hardboard complying with AHA 135.4
 - a. Thickness: 1/4 inch, unless otherwise indicated.
- C. Color/Finish: Matte Black, matching the Commissioner's approved samples.

2.2 ACCESSORY MATERIALS

- A. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized
- B. Plywood Subflooring: 2 layers of Exterior, Structural I panels or sheathing.
1. Span Rating: Not less than 16.
 2. Nominal Thickness: Not less than 3/4 inch, unless otherwise indicated.
 3. Edge Detail: Tongue and groove, unless otherwise indicated.
- C. Asphalt-Saturated Felt: ASTM D 4869, Type II.
- D. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by wood flooring manufacturer.
- E. Fasteners: As recommended by manufacturer, but not less than that recommended in NWFA's "Installation Guidelines: Wood Flooring."
1. Nails, Brads, and Staples: ASTM F 1667.
 2. Power-Driven Fasteners: NES NER-272.
 3. Wood Screws: ASME B18.6.1.
- F. Thresholds and Saddles: To match wood flooring. Tapered on each side.

1. Where stone thresholds are indicated, refer to Division 9 Section "Tiling".
- G. Base: Refer to Division 6 Section "Interior Architectural Woodwork".
- H. Reducer Strips: To match wood flooring. 2 inches wide, tapered, and in thickness required to match height of flooring.
- I. Separation Strip: 1/4 inch thick neoprene.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of wood flooring.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove coatings, including curing compounds, and other substances on substrates that are incompatible with installation adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- B. Broom or vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. Comply with flooring manufacturer's written installation instructions, but not less than applicable recommendations in NWFA's "Installation Guidelines: Wood Flooring."
- B. Wood Subfloor: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
 1. Subflooring Fastening Methods: Fasten panels as indicated below:
 - a. Nail or staple to substrate.
 - b. Space panels 1/8 inch apart at edges and ends.

- C. Provide expansion space at walls and other obstructions and terminations of flooring as indicated on Drawings, but not less than 3/4 inch.

- D. Solid-Wood Flooring: Blind nail or staple flooring to substrate.

3.4 TEMPERED HARDBOARD FLOORING

- A. Wood Subfloor: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

1. Mechanically fasten 2 inch by 2 inch by 5/8" wood support blocks into concrete substrate. Space blocks 16 inches on center.
 2. Subflooring Fastening Methods: Fasten panels as indicated below:
 - a. Nail or staple to substrate.
 - b. Space panels 1/8 inch apart at edges and ends.
 - c. Install 2 layers of subflooring, separated by slip sheet.
- B. Wood Floor Surfacing: Screw and glue tempered hardboard to plywood substrate, as indicated.
- C. Field Finishing, General: refer to Division 9 Section "Painting" more materials and application of field painted finishes.
- 3.5 PROTECTION
- A. Protect installed wood flooring during remainder of construction period with covering of heavy kraft paper or other suitable material. Do not use plastic sheet or film that might cause condensation.
1. Do not move heavy and sharp objects directly over kraft-paper-covered wood flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 096440

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SECTION 096513 - RESILIENT FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide resilient flooring in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Rubber floor tile.
2. Resilient rubber base.
3. Sound control floor underlayment
4. Vapor barrier.

- B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction Waste Management".
4. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:
1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
 2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).

5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.
- B. Product Data: For each type of product indicated, include material descriptions, dimensions of individual components and profiles, installation instructions, and finish requirements for resilient flooring.
- C. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 1. Show details of special patterns.
 2. Submit shop drawings of mock-up assembly erected for impact testing.
- D. Samples:
 1. Full-size units of each color and pattern of flooring required.
 2. 6 inch square sample of sound control floor underlayment.
 3. 6 inch square sample of vapor barrier.
- E. Product Certificates: Submit manufacturer's certificates showing compliance with performance requirements for each type of resilient flooring from manufacturer.
- F. Maintenance Data: Submit manufacturer's maintenance instructions or recommendations for resilient flooring to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation indicated.
 1. Engage an installer who employs workers for this Project who are trained by manufacturer for installation techniques required.
- B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Provide 3 foot by 3 foot mockup at Ground Floor Lobby to test for sound. Use impact tapping machine test complying with ASTM E 1007. Perform tests in presence of Acoustic Consultant. Commissioner and Acoustic Consultant shall approve the mock-up prior to testing.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.
- B. Follow the provisions of the Construction Indoor Air Quality Management Plan and the Construction Waste Management Plan.

1.6 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

PART 2 - PRODUCTS

2.1 RUBBER FLOOR TILE

- A. Available Manufacturers: Subject to compliance with requirements, provide resilient flooring as manufactured by one of the following:
 - 1. Allstate.
 - 2. Endura Rubber Flooring, a division of Burke Industries Inc.
 - 3. Johnsonite
 - 4. Mondo Rubber International, Inc.
 - 5. Approved equal.
- B. Rubber Tile: ASTM F 1344, Class I-A, homogeneous rubber tile, solid color.
 - 1. Thickness: 1/4 inch.
 - 2. Size: 25 inches by 25 inches.
 - 3. Backing Type: As standard with the manufacturer.
 - 4. Hardness: 90, measured using Shore, Type A durometer per ASTM D 2240.
 - 5. Wearing Surface: Smooth, unless otherwise indicated.
 - 6. Basis of Design: Provide "Au Natural", as manufactured by Allstate, or approved equal.
 - a. Refer to the Drawings and Material Schedule for colors.

2.2 RUBBER BASE

- A. Rubber Wall Base: ASTM F 1861. Type TP (rubber, thermoplastic)

1. Minimum Thickness: 0.125 inch.
2. Basis of Design: Provide "No Toe Wall Base", as manufactured by Roppe, or approved equal.
 - a. Size: 2 inches, unless otherwise indicated.
 - b. Color: Black.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.
 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
- C. Resilient Transition Strips: Manufacturers standard rubber composition, matching floor tiles, as indicated on the Drawings.
- D. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

2.4 SOUND CONTROL UNDERLAYMENT

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following
 1. Sound Seal; CeraZorb.
 2. Kinetics Noise Control.
 3. Approved equal.
- B. Sound Control Underlayment: Sound reducing underlayment consisting of impact-absorbing materials. Delta Impact Insulation Class (Delta IIC) of 20 when tested according to ASTM E 492; with a 6 inch thick concrete slab.
 1. Material: As indicated based on products selected by the Commissioner.
- C. Thickness: As required to meet acoustic performance criteria indicated on the Drawings.

2.5 VAPOR BARRIER

- A. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 6 mils thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are same temperature as space where they are to be installed.
 - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 VAPOR BARRIER INSTALLATION

- A. Sheet Vapor Barriers: Place, protect, and repair sheet vapor retarder over concrete substrates according to ASTM E 1643 and manufacturer's written instructions.
- B. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.4 SOUND CONTROL UNDERLAYMENT INSTALLATION

- A. Sound Control Underlayment: Install over vapor barrier in accordance with manufacturer's written instructions.
- B. Provide resilient perimeter joint at all intersections of floor with wall and structure.

3.5 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.

- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles square or at a 45-degree angle with room axis.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.6 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.

3.7 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.
- B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from exposed surfaces.
 2. Sweep and vacuum surfaces thoroughly.
 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor tile surfaces before applying liquid floor polish.
1. Apply one or two coats, as recommended by the manufacturer.
- E. Cover floor tile until Substantial Completion.
- F. Waste Management: Follow the provisions of the Construction Waste Management Plan.

END OF SECTION 096513

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SECTION 096813 – TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide carpet tile in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Modular carpet tile.
2. Full length carpet treads.

- B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction Waste Management".
4. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:
1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
 2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.

- B. Product Data: For each type of product indicated, provide manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate.
- C. Shop Drawings: Show the following:
1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
 2. Carpet type, color, and dye lot.
 3. Type of subfloor.
 4. Type of installation.
 5. Pattern of installation.
 6. Pattern type, location, and direction.
 7. Pile direction.
 8. Type, color, and location of insets and borders.
 9. Type, color, and location of edge, transition, and other accessory strips.
 10. Transition details to other flooring materials.
- D. Samples: Submit the following samples for each carpet color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
1. Carpet Tile: Full-size Sample.
 2. Carpet Tread: Full-length Sample.
 3. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch long Samples.
- E. Product Test Reports: For carpeting, for tests performed by a qualified testing agency.
- F. Maintenance Data: For carpeting to include in maintenance manuals. Include the following:
1. Methods for maintaining carpeting, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 2. Precautions for cleaning materials and methods that could be detrimental to carpeting.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.
- B. Fire-Test-Response Ratings: Where indicated, provide carpeting identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.
- C. Preinstallation Conference: Conduct conference at Project site.
1. Review methods and procedures related to carpeting installation including, but not limited to, the following:
 - a. Review delivery, storage, and handling procedures.
 - b. Review ambient conditions and ventilation procedures.
 - c. Review subfloor preparation procedures.
- D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Build mockups at locations and in sizes shown on Drawings.

2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104.

1.6 FIELD CONDITIONS

- A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpeting until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.
- C. Do not install carpeting over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpeting before installing these items.

1.7 WARRANTY

- A. Special Warranty for Carpet Tile and Treads: Manufacturer agrees to repair or replace components of carpeting installation that fail in materials or workmanship within specified warranty period.
 1. Warranty does not include deterioration or failure of carpeting due to unusual traffic, failure of substrate, vandalism, or abuse.
 2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
 3. Warranty Period: 10 years from date of Substantial Completion.

1.8 EXTRA MATERIALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Carpeting: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Interface Flor.
 2. Mohawk.
 3. Shaw Contract Group.
 4. Approved equal.

2.2 CARPET TILE

A. Basis-of-Design: Subject to compliance with requirements, provide the following:

1. Description:
 - a. Manufacturer: Interlace Flor.
 - b. Style/Pattern: Accent Flannel; #13711.
 - c. Color: Red/Charcoal, #6500.
 - d. Construction: Tufted Cut Pile.
 - e. Fiber: Type 6 Nylon.
 - f. Dye Method: 100% solution dyed.
 - g. Thickness: 0.28 inch.
 - h. Size: 20 inch by 20 inch.
 - i. Backing: Manufacturer's Glas Bac
2. Performance:
 - a. Radiant Panel: Class 1.
 - b. NBS Smoke: Less than 450.
 - c. Electrostatic Propensity: Less than 3.0 kV.

2.3 CARPET TREADS

- ### A. Basis-of-Design: Subject to compliance with requirements, provide carpet treads as indicated on the Drawings and Material Schedule.

2.4 INSTALLATION ACCESSORIES

- ### A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- ### B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
- ### C. Edge Strips: Extruded or molded heavy-duty rubber as selected by the Commissioner from the manufacturer's standard color range.

PART 3 - EXECUTION

3.1 EXAMINATION

- ### A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- ### B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpeting manufacturers.

2. Subfloor finishes comply with requirements specified in Division 03 Section "Cast-in-Place Concrete" for slabs receiving carpeting.
 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.
- C. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 CARPETING INSTALLATION

- A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet manufacturer's written installation instructions.
- B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.
- C. Maintain dye lot integrity. Do not mix dye lots in same area.
- D. Cut and fit carpeting to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- E. Extend carpeting into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- G. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 2. Remove yarns that protrude from carpet tile surface.
 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

- C. Protect carpeting against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.
- D. Waste Management: Follow the provisions of the Construction Waste Management Plan.

END OF SECTION 096813

SECTION 097200 - WALL COVERINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide wall coverings in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Cork wall tiles.

- B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction Waste Management".
4. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:
1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
 2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.

- B. **Product Data:** For each type of product indicated, include data on physical characteristics, durability, fade resistance, and flame-resistance characteristics.
- C. **Shop Drawings:** Show location and extent of each wall-covering type. Indicate pattern placement, seams and termination points.
- D. **Samples for Verification:** 12 inch square sample by full thickness.
 - 1. Sample from same run to be used for the Work, showing colors, textures, and patterns.
- E. **Product Test Reports:** Based on evaluation of comprehensive tests performed by a qualified testing agency, for wall covering.
- F. **Maintenance Data:** For wall coverings to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. **Fire-Test-Response Characteristics:** As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. **Surface-Burning Characteristics:** As follows, per ASTM E 84:
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 - 2. **Fire-Growth Contribution:** Textile wall coverings tested according to NFPA 265 and complying with test protocol and criteria in the 2003 IBC.
- B. **Mockups:** Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockups for each type of wall covering on each substrate required. Comply with requirements in ASTM F 1141.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 PROJECT CONDITIONS

- A. **Environmental Limitations:** Do not deliver or install wall coverings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. **Lighting:** Do not install wall covering until a permanent level of lighting is provided on the surfaces to receive wall covering.
- C. **Ventilation:** Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

1.6 EXTRA MATERIALS

- A. **Furnish extra materials** that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Wall-Covering Materials: For each type, full-size units equal to 5 percent of amount installed.

PART 2 - PRODUCTS

2.1 WALL COVERINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Jelinek Cork Group.
 2. AmCork.
 3. Eco Choices.
 4. Approved equal.
- B. General: Provide 100% virgin or agglomerated cork tiles.
 1. Dimensions: 24 inch by 12 inch.
 2. Thickness: 1/8 inch.
 3. Basis of Design: Refer to the Drawings for materials, sizes, products and colors.

2.2 ACCESSORIES

- A. Adhesive: Mildew-resistant, nonstaining, strippable adhesive, for use with specific wall covering and substrate application; as recommended in writing by wall-covering manufacturer and with a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Primer/Sealer: Mildew resistant, complying with requirements in Division 9 Section "Painting" and recommended in writing by wall-covering manufacturer for intended substrate.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.
- C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.

1. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 2. Painted Surfaces: Treat areas susceptible to pigment bleeding.
- D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finish with fine sandpaper.
- E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
- F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 INSTALLATION

- A. General: Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated except where more stringent requirements apply.
1. Directly apply wall coverings to substrates using manufacturers recommended adhesive.
- B. Install wall tiles with no gaps or overlaps, no lifted or curling edges, and no visible shrinkage.
- C. Match pattern 72 inches above the finish floor.
- D. Install seams vertical and plumb at least 6 inches from outside corners and 3 inches from inside corners unless a change of pattern or color exists at corner. No horizontal seams are permitted.
- E. Fully bond wall tiles to substrate level and plumb.
- F. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without any overlay or spacing between strips.

3.4 CLEANING

- A. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.
- B. Use cleaning methods recommended in writing by wall-covering manufacturer.
- C. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION 097200

SECTION 097723 - FABRIC-WRAPPED WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide wall panels in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Fabric-wrapped wall panels.

- B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction Waste Management".
4. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:

1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.

- B. Product Data: For each type of panel edge, core material, and mounting indicated.

- C. Shop Drawings: Submit detailed shop drawings for fabric-wrapped panels. Include mounting devices and details, and panel edge and core materials.
 - 1. Include elevations showing panel sizes and direction of fabric weave and pattern matching.
- D. Coordination Drawings: Show intersections with wall base, benches, doors, electrical outlets and switches, lighting fixtures, access panels, and other adjacent work.
- E. Samples for Initial Selection: For each type of fabric facing material from fabric-wrapped panel manufacturer's full range.
- F. Samples for Verification: For the following products. Prepare Samples from same material to be used for the Work.
 - 1. Fabric: Full-width by 36-inch long Sample from dye lot to be used for the Work, and as follows:
 - a. With specified treatments applied.
 - b. Show complete pattern repeat.
 - c. Mark top and face of fabric.
 - 2. Panel Edge: 12-inch long Sample showing edge profile, corner, and finish.
 - 3. Core Material: 12-inch square Sample showing corner.
 - 4. Mounting Device: Full-size Sample.
 - 5. Sample Panels: No larger than 36 by 36 inches. Show joints and mounting methods.
- G. Maintenance Data: For fabric-wrapped panels to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal recommendations.
- H. Warranty: Submit copies of special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Source Limitations: Obtain fabric-wrapped panels through one source from a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide fabric-wrapped panels with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials, fabrication, and installation.
 - 1. Install mockups in the location and of the size indicated or, if not indicated, as directed by Commissioner.
 - 2. Install mockup of typical wall area as shown on Drawings.

- a. Include intersection at wall and ceiling, corner, and door openings.

E. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with fabric and fabric-wrapped panel manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.
- B. Deliver materials and panels in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.
- C. Protect panel edges from crushing and impact.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install fabric-wrapped panels until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Lighting: Do not install fabric-wrapped panels until a permanent level of lighting is provided on surfaces to receive fabric-wrapped panels.
- C. Air-Quality Limitations: Protect fabric-wrapped panels from exposure to airborne odors such as tobacco smoke, and install panels under conditions free from odor contamination of ambient air.
- D. Field Measurements: Verify locations of fabric-wrapped panels by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fabric-wrapped panels that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, fabric sagging, distorting, or releasing from panel edge; or warping of core.
 2. Warranty Period: Two years from date of Substantial Completion.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Fabric: For each fabric, color, and pattern installed, provide length equal to 10 percent of amount installed, but no fewer than 10 yards.
 2. Fabric-Wrapped Panel Mounting Devices: Full-size units equal to 5 percent of amount installed, but no fewer than 5 attachment devices.

PART 2 - PRODUCTS

2.1 FABRIC-WRAPPED PANEL

- A. Core: Provide manufacturer's custom fabricated ceiling panels of profile and configuration as indicated on Drawings. Panels shall be constructed of not less than 6 lb./cu.-ft medium density fiberglass core with high density acoustical absorptive layer laminated to panel face and resin hardened edges.
1. Edge Detail: Square.
 2. Corner Detail: Square to form continuous profile to match edge detail.
 3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Acoustical Surfaces.
 - b. Decoustics Limited; a CertainTeed Ceilings company.
 - c. Kinetics Noise Control, Inc.
 - d. Approved equal.
 4. Basis of Design: Provide fabric wrapped panel as manufactured by Acoustical Surfaces.
 - a. Refer to the Drawings and Material Schedule for product, pattern, color, and dimensions.
- B. Fabric Facing Material: Fabric from same dye lot; color and pattern as selected by Commissioner from manufacturer's full range; matching the Commissioner's approved samples.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Maharam.
 - b. Guilford of Maine.
 - c. Approved equal.
 2. Basis of Design: Refer to the Drawings and Material Schedule for product, pattern, color, and dimensions.

2.2 FABRICATION

- A. Fabric-Wrapped Panels: Panel construction consisting of facing material adhered or attached to face, edges and back border of dimensionally stable core; with rigid edges to reinforce panel perimeter against warpage and damage.
- B. Fabric Facing: Stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other foreign matter. Applied with visible surfaces fully covered.
1. Where square corners are indicated, tailor corners.
 2. Where radius or other nonsquare corners are indicated, attach facing material so there are no seams or gathering of material.

3. Where fabrics with directional or repeating patterns or directional weave are indicated, mark fabric top and attach fabric in same direction so pattern or weave matches in adjacent panels.
- C. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch for the following:
1. Thickness.
 2. Edge straightness.
 3. Overall length and width.
 4. Squareness from corner to corner.
 5. Chords, radii, and diameters.
- D. Mounting Devices: Concealed on back of panel, recommended to support weight of panel, and as follows:
1. Adhesive: Manufacturers recommended panel adhesive.
 2. Metal "Z" Clips: Two-part panel clips, with one part of each clip mechanically attached to back of panel and the other part to wall substrate, designed to allow for panel removal.
 3. Provide additional support/mounting accessories to include, but not be limited to, hook & loop fasteners, impaling clips, and splines.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fabric, substrates, blocking, and conditions, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of fabric-wrapped panels.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Wall Panels: Install fabric-wrapped panels in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other panels, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.
- B. Comply with fabric-wrapped panel manufacturer's written instructions for installation of panels using adhesive, or type of concealed mounting accessories indicated or, if not indicated, as recommended by manufacturer. Anchor panels securely to supporting substrate.
- C. Match and level fabric pattern and grain among adjacent panels.
- D. Installation Tolerances: As follows:
1. Variation from Plumb and Level: Plus or minus 1/16 inch.
 2. Variation of Panel Joints from Hairline: Not more than 1/16 inch wide.

3.3 CLEANING

- A. Clip loose threads; remove pills and extraneous materials.
- B. Clean panels with fabric facing, on completion of installation, to remove dust and other foreign materials according to manufacturer's written instructions.

3.4 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, to ensure that fabric-wrapped panels are without damage or deterioration at time of Substantial Completion.
- B. Replace panels that cannot be cleaned and repaired, in a manner approved by Commissioner, before time of Substantial Completion.

END OF SECTION 097723

SECTION 098436 - SOUND ABSORBING CEILING UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide ceiling panels in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Wood fiber ceiling panels.
2. Adhesives for direct mount installations.

B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction Waste Management".
4. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 SUBMITTALS

A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:

1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.

- B. Product Data: For each type of product indicated, submit manufacturer's technical data for each type of acoustical ceiling panel.
- C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Method of attaching panels to building structure.
- D. Samples: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of 6-inch square Samples of each type, color, pattern, and texture.
- E. Maintenance Data: Submit manufacturer's maintenance instructions or recommendations for acoustical panel ceiling to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory, with the experience and capability to conduct the testing indicated. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.
- B. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
 - 1. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:
 - a. Flamespread: 0.
 - b. Smoke-Developed Index: 0.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with sound-absorbing ceiling unit manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.
- B. Deliver materials and units in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install sound-absorbing ceiling units until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Lighting: Do not install sound-absorbing ceiling units until a permanent level of lighting is provided on surfaces to receive the units.

- C. Air-Quality Limitations: Protect sound-absorbing ceiling units from exposure to airborne odors, such as tobacco smoke, and install units under conditions free from odor contamination of ambient air.
- D. Field Measurements: Verify locations of sound-absorbing ceiling units and actual dimensions of openings and penetrations by field measurements before fabrication.

1.7 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Conwed Designscape.
 - 2. Tectum, Inc.
 - 3. Approved equal.

2.2 ACOUSTICAL PANELS

- A. Description: Aspen wood fibers bonded with inorganic hydraulic cement, formed into a minimum 1 inch thick panel, in sizes as indicated on the Drawings.
- B. Basis of Design: Subject to compliance with requirements, provide Full Span Corridor Panels as manufactured by Tectum, Inc., or approved equal.
 - 1. Color: Black, unless otherwise indicated.
 - 2. NRC: 0.40-0.55, unless otherwise indicated.
 - 3. Edge Detail: Face rabbeted, unless otherwise indicated.
 - 4. Color: As selected by the Commissioner from manufacturer's full line.
- C. Adhesive: Type as recommended by manufacturer for substrates indicated, of sufficient strength to bond panels to substrate without failure from deflection or loads sustained from activities floors above.

2.3 ACOUSTICAL SEALANT

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
- B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
 - 2. USG Corporation; SHEETROCK Acoustical Sealant.
 - 3. Approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install acoustical ceiling panels in locations indicated with edges in alignment with walls and other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.
- B. Comply with acoustical ceiling panel manufacturer's written instructions for installation of units using adhesives indicated. Mount units securely to supporting substrate.

3.3 INSTALLATION TOLERANCES

- A. Variation from Alignment with Surfaces: Plus or minus 1/16 inch.
- B. Variation from Level or Slope: Plus or minus 1/16 inch.
- C. Variation of Panel Joints from Hairline: Not more than 1/16 inch wide.

3.4 CLEANING

- A. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions

END OF SECTION 098436

SECTION 099100 - PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide painting in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Painting of interior and exterior items and surfaces.
2. Specialty textured surface ceiling finish system.
3. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Work Not Included:

1. Pre-Finished Items: Do not include painting when shop or factory finishing is specified for such items as elevator, and mechanical and electrical equipment.
2. Concealed Surfaces: Painting is not required on surfaces in concealed and generally inaccessible areas such as pipe spaces, duct shafts and elevator shafts.
3. Operating Parts: Moving parts of mechanical and electrical devices, motor and fan shafts will not require painting.

C. Labels: Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

D. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction Waste Management".
4. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 SUBMITTALS

A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:

1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
 2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.
- B. Product Data: Submit product data that verify or are required to ensure compliance with the Contract Documents, to include technical information, shop drawings, samples, calculations, product test reports, etc.
1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 2. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
- C. Samples: Prior to painting, submit samples for Commissioner review of each required color and texture. Identify materials used on samples. Samples shall have each coat of paint exposed the same amount and tinted slightly different than other coats.
1. On 12" by 12" hardboard, submit three samples of each color, material and texture, until sheen, color, and texture are acceptable.
- D. Product Certificates: Submit manufacturer's certificates showing compliance with performance requirements for each type of painting from manufacturer.
- E. Maintenance Data: Submit manufacturer's maintenance instructions or recommendations for painting to include in maintenance manuals.
- 1.4 QUALITY ASSURANCE
- A. Applicator Qualifications: Engage an applicator shall have 3 consecutive years of professional paint experience; and be acceptable to the paint manufacturer for the application of the specified systems.
 - B. Single Source Responsibility: Use only thinners approved by paint manufacturer, and use only within recommended limits.
 - C. Mockups: Provide a full-coat mock-up finish sample of each type of coating and substrate required on the Project. Duplicate finish of approved prepared samples.
 1. The Commissioner will select one surface to represent surfaces and conditions for each type of coating and substrate to be painted.

- a. Doors: Provide samples on at least 100 sq. ft. of wall surface.
 2. After appropriate lighting has been determined, apply coatings to each surface according to the Schedule or as specified. Provide required sheen, color, and texture on each surface.
 - a. Final approval of colors will be from job-applied samples.
- 1.5 DELIVERY, STORAGE, AND HANDLING
- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.
- 1.6 PROJECT CONDITIONS
- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
 - B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
- 1.7 EXTRA MATERIALS
- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
 1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Benjamin Moore & Co.
 2. M.A.B. Paints.
 3. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

- A. Material Quality: Provide best quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying manufacturer's identification as a standard, best-grade product will not be acceptable.
 1. Compatibility: Provide materials for use within each finish system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

- B. Volatile Organic Materials: Provide paint and coating products to comply with applicable environmental regulations and local authorities. Federal numbers, where specified or referred to, are for guidelines only.
 - 1. Provide paints that comply with current Green Seal standards for low VOC limits.
- C. Undercoaters: Provide undercoaters recommended by the finish coating manufacturer for suitability with the substrate and compatibility with finish coats.
- D. Colors: As selected by Commissioner from manufacturer's full range.
 - 1. Match colors indicated by reference to manufacturer's standard color designations as scheduled.
 - 2. Gloss: Refer to the Finish Schedule on the Drawings for sheen of painted finishes for different substrates.
- E. Color Pigments: Pure, non-fading, to suit substrates and service.
 - 1. Lead content in pigment, if any, is limited to contain not more than 0.5% lead, as lead metal based on the total non-volatile (dry-film) of paint by weight.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - 1. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.
- B. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
 - 1. Ferrous Metals: Clean nongalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council.
 - a. Blast steel surfaces clean as recommended by the paint system manufacturer and in accordance with requirements of SSPC specification SSPC-SP 10 for interior surfaces and SSPC-SP 6 for exterior surfaces.
 - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
 - 2. Galvanized Surfaces: Touch-up bare and damaged areas of the shop-applied prime coat that have been damaged; wire brush, mechanically clean and/or solvent clean such areas in compliance with the manufacturers recommendations.
 - a. Use the coating materials identical to those applied in the shop. Refer to other Sections of these specifications for materials and other requirements.

3. Cementitious Materials: Prepare concrete and concrete masonry block surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen, as required, to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 4. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.
 5. Wood Substrates:
 - a. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - b. Sand surfaces that will be exposed to view, and dust off.
 - c. Prime edges, ends, faces, undersides, and backsides of wood.
 - d. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- C. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.2 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
- B. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.
- E. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.

3.3 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Commissioner, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.4 EXTERIOR PAINTING SCHEDULE

- A. Basis of Design Products: Provide the following exterior paint systems for substrates indicated on the Drawings and Finish Schedules.
- B. Metal: (Ferrous and Non-ferrous Metals):
1. Acrylic, semi-gloss Finish; 2 finish coats.
 2. Finish Coats: Semi-gloss acrylic finish (Moore's "IMC DTM Acrylic Semi-gloss", M29).

3.5 INTERIOR PAINT SCHEDULE

- A. Basis of Design Products: Provide the following interior paint systems for substrates indicated on the Drawings and Finish Schedules.
- B. Concrete Masonry Units:
1. Vinyl Acrylic Latex Eggshell Finish: 2 finish coats over a block filler:
 - a. Block Filler: Latex (Moore's 285 Moorcraft Super Craft latex Block Filler).
 - b. Two Coats: Interior Semi-gloss Latex Enamel (Moore's "Eco Spec Interior Latex Semi-Gloss Enamel", 224).
- C. Gypsum Drywall; Ceiling locations:
1. Vinyl Acrylic Latex Flat Finish: 2 finish coats over a primer.
 2. Primer Coat: Latex-based interior primer ("Moore's Fresh Start All-Purpose 100% Acrylic Primer, 023).
 3. Two Coats: Interior Flat Latex Base Paint(Moore's "Eco Spec Flat Enamel", 219)
- D. Gypsum Drywall; Wall locations:
1. 100% Semi-gloss Acrylic Latex Finish (Low Odor/Low VOC): 2 finish coats over a primer.
 - a. Primer Coat: Latex Primer / Sealer (Moore's "Pristine Eco Spec Interior Latex Primer Sealer", 231).
 - b. Two Coats: Interior Semi-gloss Latex Enamel (Moore's "Eco Spec Interior Latex Semi-gloss", 224).
- E. Metal, Ferrous, Piping, Ductwork, HVAC:
1. 100% Acrylic Latex Finish (Low Odor/Low VOC): Two finish coats over a primer.
 - a. Primer: Interior enamel primer (Moore's "Ironclad Latex Low Lustre Metal & Wood Enamel", 363).
 - b. Two Coats: Interior Semi-gloss Latex Enamel (Moore's "Eco Spec Interior Latex Semi-gloss", 224).
- F. Zinc-coated Metal:
1. 100% Acrylic Latex Finish (Low Odor/Low VOC): Two finish coats over a primer.
 - a. Primer: Interior enamel primer (Moore's "IMC Acrylic Metal Primer", M04).

- b. Two Coats: Interior Semi-gloss Latex Enamel (Moore's "Eco Spec Interior Latex Semi-gloss", 224).
- G. Wood (paint):
- 1. 100% Acrylic Latex Finish: 2 finish coats.
 - a. Base/Finish Coat: Two coats of latex-based interior matte finish (Moore's "Aura Waterborne Interior Paint", 522).

END OF SECTION 099100

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SECTION 101200 - DISPLAY CASES

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide display cases in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Wood display cases, with glazed doors, non-illuminated.

- B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction Waste Management".
4. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:

1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.

- B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for display cases.
- C. Shop Drawings: For display cases. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show location of seams and joints in visual display surfaces.
 - 2. Include sections of typical trim members.
 - 3. Wiring Diagrams: For power, signal, and control wiring.
- D. Samples for Verification: For each type of product indicated.
 - 1. Tack Surface: Not less than 8-1/2 by 11 inches, mounted on substrate indicated for final Work. Include one panel for each type, color, and texture required.
 - 2. Trim: 6-inch long sections of each trim profile, including corner section.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of fabrics.
- F. Maintenance Data: For wood and tack surfaces, operating hardware to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain display cases from single source from single manufacturer.
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.
- C. Preinstallation Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install display cases until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Verify actual dimensions of openings for display cases by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Hardboard: ANSI A135.4, tempered.
- B. Hardwood Plywood: HPVA HP-1, made with adhesive containing no urea formaldehyde.

- C. Cotton Fabric: 100% cotton; weighing 211 g/m²; with flame-spread index of 25 or less when tested according to ASTM E 84.
 - 1. Refer to the Drawings and Material Schedule for products, colors, and sizes.
- D. Transparent Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), with Finish 1 (smooth or polished), colorless sheet with visible light transmittance of 92 percent measured per ASTM D 1003.
- E. Fasteners: Provide screws, bolts, and other fastening devices made from same material as items being fastened, except provide hot-dip galvanized, stainless-steel, or aluminum fasteners for exterior applications. Provide types, sizes, and lengths to suit installation conditions. Use security fasteners where exposed to view.

2.2 DISPLAY CASE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Best-Rite Manufacturing.
 - 2. Claridge Products and Equipment, Inc.
 - 3. PolyVision Corporation; a Steelcase company.
 - 4. Approved equal.
- B. Surface Mounted Cabinet (Typical Locations): Factory-fabricated cabinet; with tackboard assembly on back inside surface and operable glazed doors at front.
 - 1. Cabinet Box: Hardwood veneer plywood.
 - 2. Cabinet Frame and Trim: Manufacturer's standard hardwood species, or as selected by the Commissioner; with transparent finish.
 - 3. Veneer Species: Manufacturer's standard veneer, or as selected by the Commissioner; with transparent finish.
- C. Recessed Cabinet (At Elevator Cab only): Factory-fabricated cabinet; with tackboard assembly on back inside surface, operable glazed doors at front, and trim on face to cover edge of recessed opening.
 - 1. Cabinet Box: Hardwood veneer plywood.
 - 2. Cabinet Frame and Trim: Manufacturer's standard hardwood species, or as selected by the Commissioner; with transparent finish.
 - 3. Veneer Species: Manufacturer's standard veneer, or as selected by the Commissioner; with transparent finish.
- D. Glazed Hinged Doors: Acrylic plexi-glass; set in frame matching cabinet material and finish. Equip each door with full-height continuous hinge and cylinder lock with two keys.
 - 1. Thickness: Not less than 1/4 inch thick.
 - 2. Number of Doors: Minimum of two; or as indicated on the Drawings.
- E. Shelves: 1/4 inch thick Acrylic glass; supported on adjustable shelf standards and supports.
 - 1. Number of Shelves: As indicated on the Drawings.

- F. Adjustable Shelf Standards and Supports: BHMA A156.9, B04102; with shelf brackets, B04112; recess mounted in rear surface. Provide standards full height of display case.

- 1. Color: As selected by the Commissioner from manufacturer's full range.

- G. Dimensions: As indicated on the Drawings.

2.3 FABRICATION

- A. Fabricate display cases to requirements indicated for dimensions, design, and thickness and finish of materials.
- B. Fabricate cabinets and door frames with reinforced corners, mitered to a hairline fit, with no exposed fasteners.
- C. Fabricate exterior units with vents to permit evaporation of moisture trapped inside.
- D. Fabricate shelf standards plumb and at heights to align shelf brackets for level shelves.

2.4 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine walls and partitions for proper backing and suitable framing depth for recessed units.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for display cases as required by type and size of unit.

3.3 INSTALLATION

- A. General: Install units in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

1. Mounting Height: 72 inches above finished floor to top of cabinet.
 - B. Surface-Mounted Display Cases: Attach units to wall surfaces with concealed clips, hangers, or grounds fastened at not more than 16 inches o.c. Secure both top and bottom of display cases to walls
 - C. Recessed Display Cases: Attach units to wall framing with fasteners at not more than 16 inches o.c. Attach aluminum trim over edges of recessed display cases and conceal grounds and clips. Attach trim with fasteners at not more than 24 inches o.c.
 - D. Install display case shelving level and straight.
- 3.4 ADJUSTING AND CLEANING
- A. Adjust doors to operate smoothly without warp or bind and so contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.
 - B. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION 101200

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SECTION 101400 - SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide signage in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Interior room, directional, egress, and code required identification signage, to the extent indicated on the Drawings and required by code.

B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction Waste Management".
4. Division 1 Section "Construction IAQ Requirements".

1.2 DEFINITIONS

A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.3 LEED BUILDING, GENERAL REQUIREMENTS

A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.4 SUBMITTALS

A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:

1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.

4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.
- B. Product Data: Submit product data for each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- C. Shop Drawings: Shop drawings showing fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, layout, reinforcement, accessories, and installation details.
1. Provide message list, including details of wording and lettering layout, at least half size. Include full-size details of special graphics.
 2. Furnish full-size templates for cutout letters, numbers, and other graphic symbols.
 3. Provide setting drawings, templates, and directions for installing anchor bolts and other anchors to be installed as a unit of Work in other Sections.
 4. Provide full size layout submittal for each sign, with an accurate photocopy or pen plot, and showing typeface, proposed color, material and all other required information.
- D. Samples: Submit samples of each sign component for initial selection of color, pattern, and surface texture as required and for verification of compliance with requirements indicated.
1. Submit for approval by the Commissioner, sample panels identifying the lettering, graphic content, including raised design; and layout to match the design intent of each signage unit.
 2. Aluminum: 6 inch square sample, showing etching or raised lettering, and edge condition.
- E. Maintenance Data: For signs to include in maintenance manuals.
- F. Warranty: Submit copies of special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer/Fabricator Qualifications: Engage an experienced installer who is also the manufacturer of the signs and who has completed manufacturer and installation of signs similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.
- C. Regulatory Requirements: Provide graphic content, style and sign copy that complies with the requirements of the ADA-ABA Accessibility Guidelines and ANSI 117.1, Latest Edition and local authorities having jurisdiction for size, style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices

1.6 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit installation of signs in exterior locations to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify recess openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 COORDINATION

- A. Coordinate placement of anchorage devices with templates for installing signs.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of metal finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image colors.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of Alloy 5005-H32.
- B. Aluminum Castings: ASTM B 26, of alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated.
- C. Fasteners: Provide brass finish Phillips flat-head machine screws for exposed fasteners; set into predrilled holes, unless otherwise indicated on the Drawings or directed by the Commissioner. Use fasteners that are not corrosive to the sign material and mounting surface.
- D. Adhesive Mounting: Where directed, provide double sided tape or pressure-sensitive silicone-Adhesive backing, as required to adhere and support sign loads and as recommended by signage manufacturers.

2.2 PANEL SIGNS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. ASI-Modulex, Inc.
 - 2. Best Sign Systems Inc.
 - 3. InPro Corporation.

4. Approved equal.
- B. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner, complying with the following requirements:
1. Aluminum Sheet: 0.050 inch thick, minimum.
 2. Edge Condition: Beveled.
 3. Corner Condition: Square.
- C. Tactile and Braille Sign: Manufacturer's standard process for producing text and symbols complying with ADA-ABA Accessibility Guidelines and with ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.
1. Panel Material: Aluminum.
 2. Raised-Copy Thickness: Not less than 1/32 inch.
- D. Graphic Content and Style: Provide copies of each type of signage identifying the requirements indicated for letter on a style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices.
1. Provide signage for the following conditions, to the extent indicated on the drawings or as directed by the Commissioner, unless otherwise indicated.
 - a. Room identification.
 - b. Means of egress.
 - c. Emergency exit.
 - d. Location; directional.
 2. Lettering: Provide lettering displayed in message types as indicated; with Font, size, height, and/or depth as indicated, matching existing conditions and approved samples and shop drawings.
 3. Panel Sign Schedule: As indicated on the Drawings.
- E. Mounting:
1. Provide manufacturer's standard adhesives appropriate for mounting signs that project at right angles from walls and ceilings.
 2. Fasten signage securely to walls with in methods to comply with manufacturer's written instructions for each sign, and to match existing conditions.

2.3 FABRICATION

- A. Panel Signs: Provide smooth, even, level sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/32 inch measured diagonally from corner to corner.
1. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

2.4 FINISHES

- A. Clear Anodic Finish: Manufacturer's standard Class 1 clear anodic coating, 0.018 mm or thicker, over a polished (buffed) mechanical finish, complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Verify that items, including anchor inserts are sized and located to accommodate signs.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Locate sign units and accessories where indicated use mounting methods of the type described and in compliance with the manufacturer's instructions.
 - 1. *Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.*
- B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.
 - 1. **Silicone-Adhesive Mounting:** Use liquid silicone adhesive recommended by the sign manufacturer to attach sign units to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended by the sign manufacturer to hold the sign in place until the adhesive has fully cured.
 - 2. **Mechanical Fasteners:** Use nonremovable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.

3.3 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by the City of New York.

END OF SECTION 101400

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SECTION 102113 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide toilet compartments in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Stainless steel toilet compartments and urinal screens.

- B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction Waste Management".
4. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:
1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
 2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.

- B. Product Data: For each type of product indicated, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- C. Shop Drawings: Submit detailed shop drawings for toilet compartments, including plans, elevations, sections, details, and attachments to other work.
 - 1. Show locations of cutouts for compartment-mounted toilet accessories.
 - 2. Show locations of reinforcements for compartment-mounted grab bars.
 - 3. Show locations of centerlines of toilet fixtures.
- D. Samples for Initial Selection: For each type of unit indicated, include Samples of hardware and accessories involving material and color selection.
- E. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
 - 1. Each type of material, color, and finish required for units, prepared on 6-inch square Samples of same thickness and material indicated for Work.
 - 2. Each type of hardware and accessory.
- F. Product Certificates: For each type of toilet compartment, from manufacturer.
- G. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Comply with requirements in GSA's CID-A-A-60003, "Partitions, Toilets, Complete."
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.
- C. Regulatory Requirements: Comply with applicable provisions in "Architectural Barriers Act Accessibility Standards" (ABAAS) for toilet compartments designated as accessible.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Bradley Corporation; Mills Partitions.
 - 2. General Partitions Mfg. Corp.
 - 3. Hadrian Manufacturing Inc.
 - 4. Scranton Products.

5. Approved equal.

2.2 MATERIALS

- A. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- B. Stainless-Steel Castings: ASTM A 743.

2.3 SOLID PLASTIC UNITS

- A. Basis of Design: Subject to compliance with requirements, provide products as manufactured by Scranton Products.
- B. Toilet-Enclosure Style: Floor anchored.
- C. Door, Panel, and Pilaster Construction: Seamless, metal facing sheets pressure laminated to core material; with continuous, interlocking molding strip or lapped-and-formed edge closures; corners secured by welding or clips and exposed welds ground smooth. Exposed surfaces shall be free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections.

1. Core Material: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in 1/2 inch thickness as required to provide finished thickness of 1 inch for doors and panels and 1-1/4 inches for pilasters.
2. Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units.
3. Tapping Reinforcement: Provide concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to units.

D. Urinal-Screen Construction:

1. Flat-Panel Urinal Screen: Matching panel construction.

E. Facing Sheets and Closures: Stainless-steel sheet of nominal thicknesses as follows:

1. Pilasters: Manufacturer's standard thickness, but not less than 0.0478 inch.
2. Panels and Doors: Manufacturer's standard thickness, but not less than 0.030 inch.

F. Pilaster Shoes and Sleeves (Caps): Stainless-steel sheet, not less than 0.030 inch nominal thickness and 3 inches high, finished to match hardware.

G. Brackets (Fittings):

1. Stirrup Type: Stainless steel Ear or U-brackets; as standard with selected manufacturer.

H. Stainless-Steel Finish: No. 4 bright, directional polish on exposed faces. Protect exposed surfaces from damage by application of strippable, temporary protective covering before shipment.

2.4 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.

1. Material: Stainless steel, unless otherwise indicated.

2. Hinges: Manufacturer's standard wrap-around hinges; self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.
 3. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
 4. Coat Hook: Refer to Division 10 Section "Toilet Accessories" for coat hooks.
- B. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.
- C. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

2.5 FABRICATION

- A. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- B. Door Size and Swings: Unless otherwise indicated, provide 24-inch wide, in-swinging doors for standard toilet compartments and 36-inch wide, out-swinging doors with a minimum 32-inch wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2 inch.
 - b. Panels and Walls: 1 inch.
 2. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than two brackets attached near top and bottom of panel.
 - a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Floor-Anchored and Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

3.2 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113

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SECTION 102800 – TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide bathroom accessories in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Public use bathroom accessories.

- B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:

1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.

- B. Product Data: For each type of product indicated, include the following:

1. Construction details and dimensions.
 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 3. Material and finish descriptions.
- C. Samples: Full size, for each accessory item to verify design, operation, and finish requirements.
1. Approved full-size Samples will be returned and may be used in the Work.
- D. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
1. Identify locations using room designations indicated.
 2. Identify products using designations indicated.
- E. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

1.5 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Steel Sheet: ASTM A 1008, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.
- C. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Available Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Typical Accessories:
 - a. American Specialties.
 - b. Bobrick Washroom Equipment, Inc.

- c. Bradley Corporation.
 - d. Georgia Pacific.
 - e. SMEDBO.
2. Specialty Sanitizers, Dispensers, and Fresheners:
 - a. Purell.
 - b. Impact Products.
 - c. Scencibles.
 - d. Vectair.
 - e. Approved equal.
- B. Toilet Tissue Dispenser (Typical Locations):
1. Material/Finish: Stainless steel; satin finish.
 2. Basis of Design: Provide "Compact Side-by-Side Coreless Tissue Dispenser", as manufactured by Georgia Pacific, or approved equal.
- C. Soap Dispenser, Wall Mounted:
1. Material/Finish: White plastic, clear acrylic.
 2. Basis of Design: Provide "Clear-Vu Foam EEZ - Bulk Foam", as manufactured by Impact Products, or approved equal.
- D. Grab Bars:
1. Material/Finish: Stainless steel; satin finish, with concealed flanges.
 2. Dimensions: 1-1/4" diameter by lengths as indicated.
 3. Basis of Design: Provide #31001 Series, as manufactured by American Specialties, or approved equal.
- E. Baby Changing Station, Recessed:
1. Material/Finish: Door, flange and cabinet shall be Stainless steel, satin finish. Bed liner shall be light gray, high impact plastic with a smooth finish for easy cleaning.
 2. Basis of Design: Provide #9013 Recessed Baby Changing Station, as manufactured by American Specialties, or approved equal.
- F. Paper Towel Dispenser, Surface Mounted:
1. Material/Finish: Black Translucent Plastic.
 2. Basis of Design: Provide "SofPull Regular Capacity Centerpull Towel Dispenser", as manufactured by Georgia Pacific, or approved equal.
- G. Waste Receptacle, Recessed:
1. Material/Finish: Stainless steel; satin finish.
 2. Basis of Design: Provide #6474, as manufactured by American Specialties, or approved equal.
- H. Air Freshener, Wall Mounted:
1. Material/Finish: Bright Chrome.
 2. Basis of Design: Provide Vectair Airoma Automatic Fragrance Dispenser, as manufactured by Vectair Systems, or approved equal.

- I. Toilet Seat Sanitizer Dispenser:
1. Material/Finish: Bright Chrome.
 2. Basis of Design: Provide Vectair Safeseat #VECSAFESEAT, as manufactured by Vectair Systems, or approved equal.
- J. Toilet and Urinal Cleanser Dispenser:
1. Material/Finish: Bright Chrome.
 2. Basis of Design: Provide Vectair Quadrasan 300, as manufactured by Vectair Systems, or approved equal.
- K. Hand Sanitizer:
1. Material/Finish: Brushed chrome metallic finish.
 2. Basis of Design: Provide # 2790-12-EEU00, as manufactured by Purell, or approved equal.
- L. Dual Sanitary Napkin and Tampon Dispenser, Recessed:
1. Material/Finish: Stainless steel; satin finish.
 2. Basis of Design: Provide #64681 Recessed Mounted Dual Sanitary Napkin and Tampon Dispenser, as manufactured by American Specialties, or approved equal.
- M. Sanitary Napkin Disposal:
1. Material/Finish: Stainless steel; satin finish.
 2. Basis of Design: Provide #CDSS Sanitary Napkin Disposal, as manufactured by Scencibles, or approved equal.
- N. Coat Hook:
1. Material/Finish: Stainless steel; satin finish.
 2. Basis of Design: Provide P/N 14.5605.02.002, as manufactured by D Line, or approved equal.
- O. Toilet Tissue Dispenser (WC-202):
1. Material/Finish: Stainless steel; satin finish.
 2. Basis of Design: Provide #FK606, as manufactured by SMEDBO, or approved equal.
- P. Shower Seat:
1. Material/Finish: Frame; stainless steel with satin finish; Seat closed-cell polyurethane foam padding.
 2. Basis of Design: Provide B-518, as manufactured by Bobrick Washroom Equipment, Inc., or approved equal.
- Q. Shower Rod:
1. Material/Finish: Stainless steel; satin finish.
 2. Basis of Design: Provide "Heavy Duty Shower Rod", as manufactured by Bobrick Washroom Equipment, Inc., or approved equal.

2.3 ACCESSORIES

- A. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to City of New York's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800

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SECTION 104400 - FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide fire protection in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Portable fire extinguishers.
2. Fire protection cabinets for portable fire extinguishers, fire hoses, and combination units.

- B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:

1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.

- B. Product Data: For each type of product indicated, include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher, mounting brackets, and cabinets.
 - 1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
 - 2. Show location of knockouts for hose valves.
- C. Shop Drawings: For fire protection cabinets, include plans, elevations, sections, details, and attachments to other work.
- D. Product Certificates: Submit manufacturer's certificates showing compliance with performance requirements for each type of fire protection specialty from manufacturer.
- E. Maintenance Data: Submit manufacturer's maintenance instructions or recommendations for fire protection specialty to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.
- C. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to fire protection cabinets including, but not limited to, the following:
 - a. Schedules and coordination requirements.

1.5 COORDINATION

- A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire protection cabinets with wall depths.

1.6 SEQUENCING

- A. Apply decals on field-painted, fire protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide fire protection specialties as manufactured by one of the following:
 - 1. J. L. Industries, Inc.
 - 2. Larsen's Manufacturing Company.
 - 3. Potter Roemer LLC.

4. Approved equal.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B.
- B. Stainless-Steel Sheet: ASTM A 666, Type 304.
- C. Tempered Break Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm thick.

2.3 FIRE EXTINGUISHERS

- A. General: Provide fire extinguishers for each extinguisher cabinet and other locations indicated, in color and finishes selected by the Commissioner from manufacturer's standard which comply with requirements of governing authorities.
 1. Fill and service extinguishers to comply with requirements of governing authorities and manufacturer.
- B. Multi-Purpose Dry Chemical Type Extinguisher: UL-rated 4-A:60-B:C, 10-lb nominal capacity, in enameled steel container, for Class A, Class B and Class C fires as indicated.

2.4 FIRE PROTECTION CABINETS

- A. Cabinet Construction: Manufacturer's standard steel box, equipped with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth.
 1. Fire-Rated Cabinets (Recessed, where indicated): Construct fire-rated cabinets with double walls fabricated from 0.0428-inch thick, cold-rolled steel sheet lined with minimum 5/8-inch thick, fire-barrier material. Provide factory-drilled mounting holes.
 - a. Rating: As indicated on the Drawings or directed by the Commissioner.
- B. Recessed Cabinet: Cabinet box recessed in walls of sufficient depth to suit style of trim indicated.
 1. Trimless with Hidden Flange: Flange of same metal and finish as box overlaps surrounding wall finish and is concealed from view by an overlapping door.
 2. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
- C. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim.
- D. Cabinet Trim Material: Same material and finish as door.
- E. Door Material: Stainless-steel sheet.
 1. Door Style: Fully glazed panel with frame
 2. Door Glazing: Tempered break glass.
 3. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 - a. Provide manufacturer's standard hinge permitting door to open 180 degrees.

- b. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.

F. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Location, color and orientation as directed by the Commissioner.
 - a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."
 - 1) Location: Applied to cabinet door.
 - 2) Application Process: Decals.
 - 3) Lettering Color: Black.
 - 4) Orientation: Vertical.

2.5 FABRICATION

- A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 1. Weld joints and grind smooth.
 2. Provide factory-drilled mounting holes.
 3. Prepare doors and frames to receive locks.
 4. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
 2. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.6 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 1. Color and Gloss: As selected by the Commissioner from manufacturer's full range.
- C. Stainless Steel Finishes:
 1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

2. Polished Finish: Grind and polish surfaces to produce uniform finish, free of cross scratches. Run grain of directional finishes with long dimension of each piece.
3. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine roughing-in for hose valves and cabinets to verify actual locations of piping connections before cabinet installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Install fire extinguishers, mounting brackets, and fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights indicated below:
 1. Fire Protection Cabinets: 54 inches above finished floor to top of cabinet.
- D. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.
 1. Unless otherwise indicated, provide recessed fire protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semirecessed fire protection cabinets.
 2. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.
- E. Identification: Apply decals or vinyl lettering at locations indicated.

3.2 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.
- E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104400

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SECTION 113100 - APPLIANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Provide appliances in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Refrigerator units, undercounter.
2. Ice makers.
3. Clothes washers and dryers.

B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction Waste Management".
4. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 SUBMITTALS

A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:

1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.

- B. Product Data: For each type of product indicated, include rated capacities, operating characteristics, dimensions, furnished accessories, and finishes for each appliance.
- C. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard size.
- D. Product Certificates: For each type of appliance, from manufacturer.
- E. Field quality-control reports.
- F. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.
- G. Warranty: Submit copies of special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained by manufacturer for installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain residential appliances from single source.
- C. Regulatory Requirements: Comply with the following:
 - 1. NFPA: Provide electrical appliances listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. Energy Performance, ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.
 - 3. Provide gas-burning appliances that comply with ANSI Z21 Series standards
- D. Accessibility: Where appliances are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.
- E. Preinstallation Conference: Conduct conference at Project site.

1.5 WARRANTY

- A. Special Warranties: Manufacturer's standard form in which manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Refrigerator, Sealed System: Full warranty including parts and labor for on-site service on the product.
 - 1. Warranty Period for Sealed Refrigeration System: Two years from date of Substantial Completion.
 - 2. Warranty Period for Other Components: Two years from date of Substantial Completion.
- C. Dishwasher: Full warranty including parts and labor for on-site service on the product.
 - 1. Warranty Period for Deterioration of Tub and Metal Door Liner: Five years from date of Substantial Completion.

2. Warranty Period for Other Component: Two years from date of Substantial Completion.
- D. Clothes Washer: Full warranty including parts and labor for on-site service on the product.
1. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 APPLIANCES

- A. Manufacturers/ Products: Refer to the Drawings and Finish Schedules for manufacturers, products, sizes, and finishes.

2.2 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written instructions.
- B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.
- C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- D. Utilities: See Divisions 22 and 26 for plumbing and electrical requirements.

3.3 FIELD QUALITY CONTROL

- A. Tests and Inspections:

1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
 2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 3. Operational Test: After installation, start units to confirm proper operation.
 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.
- B. An appliance will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 113100

SECTION 11 61 23 - PERFORMANCE PLATFORMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Performance platforms are to be provided and installed for the following performance spaces:
 - 1. Theatre 1
 - 2. Theatre 2
 - a. Audience seating platforms
 - b. Performance platforms
 - c. Step units
 - d. Chair rail, railings and accessories

1.3 SYSTEM DESCRIPTION

- A. Section Includes:

- 1. Materials, Components, Modifications, Assemblies, Equipment and Services as Specified Herein. These include:
 - a. Verification of site dimensions and conditions
 - b. Submittals as required by the Contract Documents
 - c. Submission of Shop Drawings
 - d. Manufacture of equipment and systems as required by the Contract Documents
 - e. Scheduling, sequencing and coordination with other trades
 - f. Site supervision of installation specified herein and elsewhere in the Contract Documents
 - g. Testing and demonstration as specified herein and elsewhere in the Contract Documents
 - h. Instruction to the City of New York's representatives
 - i. Record Drawings and Operation and Maintenance manuals as specified herein and elsewhere

- B. Provide Systems including:

- 1. Aluminum extrusion framed platforms with connecting devices and demountable leg supports including telescopic legs as shown in the drawings.
- 2. Provide chair rail and railings in quantities indicated in the drawings and schedule.
- 3. Step units as indicated in the schedule and drawings
- 4. Spare parts in quantities sufficient to service system and provide various opening configurations. This includes extra frames, braces, and nodes.
- 5. Additional support structures as required to meet the intent of the Contract Documents

- C. Related Sections:
 - 1. DDC General Conditions:
 - a. Submittal Procedures
 - b. Project Record Documents
 - 2. Division 5: Metals
 - 3. Division 6: Wood and Plastics
 - 4. Division 11: Performance Equipment

1.4 SYSTEM DESCRIPTION

- A. Design Requirements:
 - 1. Platform units shall be self-supporting and independent in function and operation. Units shall be top locking using a cam-type "Dual-Lock" or provide manufacturer's proprietary platform to platform locking system for review.
- B. Performance Requirements:
 - 1. The following establishes minimum safety requirements for the system. Where Federal, State and Local Legislation address these topics, the more stringent requirement takes precedence. Factors listed below in no way relieve the Theatrical Equipment Contractor from responsibility of providing a safe system.
 - a. Vertical Live Load (in addition to platform weight): 150 psf.
 - b. Lateral Live Loading: 10% of the maximum Vertical load with the Vertical load imposed simultaneously.

1.5 SUBMITTALS

- A. All submittals shall be in accordance with DDC General Conditions.
- B. Shop Drawings:
 - 1. Shop drawings shall be submitted within ninety (90) days of award of contract.
 - 2. Drawings will show all information necessary to explain fully the design features, appearance, function, fabrication, installation, and use of system components in all phases of operation.
 - 3. Fabrication, Installation, and Erection shall not commence until shop drawings have been approved by the Commissioner .
 - 4. All drawing sheets in the submittal shall be of the same size (min. 11" x 17").
 - 5. Submittal shall include a title sheet listing all sheets in the submittal.
 - 6. Submittal shall include a complete bill of materials showing all items being supplied by the manufacturer.
- C. Record Documents:
 - 1. Record Documents shall be submitted in accordance with DDC General Conditions.
 - 2. Operations and Maintenance Manuals, in quantities of five, shall include:
 - a. Contact information for Theatre Equipment Contractor and pertinent manufacturers
 - b. Safety and Operational Instructions
 - c. Complete parts and subassembly list

- d. Equipment design parameters such as safe working loads and duty cycles
 - e. Periodic Maintenance Schedule
 - f. Maintenance procedures for finishes
 - g. Certificates of compliance with applicable codes
 - h. Records of final testing and log
 - i. Spare parts list and source information
3. Include complete as-built/as-installed drawings depicting all system layouts and maximum load limitations (drawn not less than 1/4" = 1'-0").
 4. Provide layout diagram with laminated durable finish.

1.6 QUALITY ASSURANCE

A. Certifications:

1. Certificate of Installation: The Contractor shall submit certificates from the manufacturer's field engineer stating the installed system is operating properly and complies with manufacturer's recommendations. (Provide as part of Operation and Maintenance Manuals.)

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment securely wrapped in factory fabricated wooden or fiberboard type containers.

B. Acceptance at Site:

1. Coordinate delivery and installation of equipment with the City of New York and Commissioner. Contractor shall inventory all equipment and inspect for damage upon notification that equipment has been delivered. Provide a copy of this inventory to the City of New York and Commissioner.

1.8 PROJECT / SITE CONDITIONS

A. Field Measurements:

1. Contractor is to verify all dimensions as they relate to requirements of the specification and manufacturer's requirements, and is to notify the City of New York and Commissioner of any variations, which would affect the installation and safe operation of the systems.

1.9 WARRANTY

A. Special Warranty:

1. Warrant systems and equipment to be free of defective components, faulty workmanship and improper adjustment for a period of two (2) years from the date of City of New York's acceptance. Paint and exterior finishes are excluded.
2. Replace items showing evidence of defective materials or workmanship (including installation workmanship) within thirty (30) days after notification. Make replacements without cost to the City of New York.
3. Rectify conditions that might present a hazard to human life, well being and or property within forty-eight (48) hours of notification.

B. Extra Materials:

1. Provide 2 extra T-type handles or tools required for locking platforms together
2. Provide 3 extra male and 3 extra female top locking cam-type locks or for other platform locking devices, if device is not captured, provide total 50 spares.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide the system from components (except where otherwise stated) that are the products of one of the following manufacturers:

1. Platforms and support Framing System:
 - a. Wenger, Owatonna, MN
 - b. SECOA, Champlain, MN
 - c. Staging Concepts, Inc. Minneapolis, MN
 - d. StageRight Corp., Clare, MI
 - e. Steeldeck, Brooklyn, NY

2.2 MATERIALS

A. Materials shall conform to the following ASTM and ANSI standard specifications:

1. Steel:
 - a. Structural steel shapes and plate shall be A36.
 - b. Steel tube shall be A500.
 - c. All welding shall conform with AWS D.1.1 Structural Welding Code.
2. Aluminum:
 - a. Aluminum shapes and extrusions shall be 6000 series alloy with a minimum temper of T5.
3. Fasteners:
 - a. Comply with ANSI B18.2.1&2 Specification for square and hex bolts and nuts.
 - b. All bolts and fasteners must be grade 5 or better.

B. Platform Surfaces:

1. Material: Tempered hardboard laminated plywood. Natural finish.
2. Internal Plywood's: Plugged grade "C" western softwood.
3. Thickness: Min. 1" as required for loads.
4. 1/16" Polyphenolic finish surface in black bonded to plywood substrate.

C. Platform - Acoustical Damping:

1. Material: Glass fiber.
2. Thickness: 2".
3. Construction: Fibrous material faced on exposed side with black pigmented fire resistant coating.

4. Minimum Density: 3 PCF.
5. Operating Temperature Limit: 250° F (ASTM C 411).
6. Moisture Absorption: <3% by weight (ASTM C 553).
7. Corrosiveness: Will not cause corrosion greater than sterile cotton to aluminum or steel (ASTM C 665).
8. Organic Growth: None (UL 181).
9. Flame Spread: 25 (UL 723).
10. Smoke Developed: 50 (UL 723).
11. Permissible Adhesives: ASTM C 916.
12. Additional Specifications: ASTM C 1071 Type 1; NFPA 90 A & B; California Title 20; SMACNA Standards; Fed. SPEC HH-I-545B (Amend. 2).
13. Acceptable glass fiber manufacturers:
 - a. Insul-Shield, Johns Manville Corp., Denver, CO
 - b. Fiberglass Coated Duct Liner, Owens Corning

2.3 COMPONENTS

A. Platform Fasteners:

1. Unit-to-Unit Connection: Top operating rotary locking fasteners operable by hexagonal "Allen" type key. Tension loading: 2500 lb.
 - a. Acceptable: Dual-Lock Fastener, Simmons Fastener Corp., Albany, NY
 - b. Or manufacturer supplied alternate unit submitted for approval.

B. Audience Seating Platforms and Performance Platforms:

1. Provide quantities and shapes as depicted on the drawings.
2. Construct platform framing from the aluminum extrusion described herein and as depicted on the Drawings.
3. Perforate the inside flange of the extrusion to accept tapping screws for securing the platform deck to the frame from underneath.
4. If manufacturer's proprietary device is not provided, mill the external web of the framing member as indicated to accept the platform fastening locks. Provide each platform with fastening locks in the pattern depicted on the Drawings. Align locks to allow interconnection. Allow the fastening locks to be removed without removing decking material. Provide extension brackets and hardware required to mount locks in framing. Perforate the top flange of the extrusion and decking to allow operation of the locks from above.
5. Fabricate rectangular platform framing by employing internal splice blocks and mechanical connections. Avoid welded connections where possible.
6. Rivet leg brackets at all internal 90 degree intersections. Install leg brackets with not less than four (4) appropriately sized blind rivets. Align leg brackets to provide appropriate platform support.
7. Leg support system shall join to the platform by means of a bracket on the underside of the platform and held in place by a 3/8" 16-socket head cap screw with a plastic tightening knob or a handle operated cam compression device.
8. Frames shall be mill finished. Legs, braces and hardware shall be finished black.

C. Railings

1. Railings shall be provided as indicated in the drawings and the schedule.
2. All railings shall be fabricated to meet code requirements for heights, sizes and shapes of railings and structural rigidity.

3. Railings shall be provided in demountable sections, no single section greater than 3'-0" in length.
4. Railing sections shall be demountable and attach to the edge of the platforms utilizing the extrusion. Method of attachment shall not require more than the use of one tool and shall not damage the platform. When railings are not in use there shall be no evidence of the railing attachment method.
5. Finish railings and associated hardware black.

D. Chair Rail

1. Provide two pieces of chair rail per platform, one for the long side and one for the short side.
2. Chair rail shall meet any and all local code requirements.
3. Chair rail shall be a nominal 1" high unless otherwise dictated by codes.
4. Chair rail shall be demountable. Method of attachment shall not require more than the use of one tool and shall not damage the platform. When chair rail is not in use there shall be no evidence of the attachment method.
5. Chair rail shall be finished black.
6. Chair rail shall be able to be mounted to the platform both with and without te railing in place.

E. Legs

1. Provide legs in the quantities and sizes shown in the schedule.
2. Each leg shall be fitted with an adjustable foot complete with rubber pad.
3. Legs shall be finished black in color.

F. Aisle lights

1. LED rope lights shall be provided as aisle/step lights.
2. Rope light shall fit into extrusion as shown in the drawings.
3. Sections of rope light shall be circuited to "daisy chain" plug into each other with a minimum cord length of 3'-0".
4. 10 Extension cords shall be provided at 50 feet each. Finish black.
5. Mount rope light to fascias as shown in the drawings. Fascias shall mount to the platform extrusion. When not in use there shall be no evidence of fascia attachment.
6. Aisle lights shall meet all the requirements of the 2008 NYC Building Code Section 1006.2: .5 foot candles and each step shall have a light.

G. Flame Retardant Coatings:

1. Apply an approved flame-retardant coating to the underside of the platform decking prior to installation of acoustical damping. Conform to the manufacturer's requirements for preparation, application and drying. Conform to applicable legislation in regards to coating type and application requirements.

H. Signage:

1. Provide signage legible both in construction and grammar.
2. For the trap infill system, Provide wall mounted diagrams depicting the platform system layout (drawn not less than 1/4"=1'-0") in a protective transparent faced frame. Placement as directed by Commissioner .
3. Identify each platform by a white stenciled number not less than 4" high that corresponds to the layout plans included in the manual. Apply the number on the underside face of the acoustical damping of the platform.

I. Storage Carts

1. No carts are to be provided.

2.4 FINISHES

- A. Steel parts: Powder coat finish, color black.
- B. Aluminum frames and supports: Mill finish.

2.5 SUPPLEMENTARY

- A. Provide equipment and hardware in addition to the items specified previously that are necessary to provide a fully working system in conformance with the intent of the Contract Documents.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Examine work prepared by others to receive work of this Section and report defects affecting installation to the Construction Manager for correction. Commencement of the work shall be construed as complete acceptance of preparatory work by others. The sphere of inspection includes but is not limited to:
 - a. Assurance mounting surfaces are ready to accept the Work
 - b. Verification of flatness, plumb and level of mounting conditions
 - c. Inspection of components of the Work to ensure no damage has occurred during shipping or storage

B. Discrepancies:

1. In the event of discrepancies, immediately notify the Commissioner and Theatre Consultant.
2. Do not proceed with the installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 PREPARATION

A. Verify field measurements at the site prior to installation and modify the system accordingly.

1. Deliver equipment to the site only after the building has been closed in. Coordinate storage at the site and ensure the materials and components are undamaged.
2. Protect the surrounding environment from damage by the Work.

B. Surface Preparation:

1. Clean surfaces as necessary prior to commencing the Work.

3.3 ERECTION, INSTALLATION AND APPLICATION

- A. Erection: Install platforms as indicated on the Drawings.

- B. A minimum of three separate installation periods for each platform system may be required, including:

1. Initial installation for contractor verification and system adjustment
2. Installation and demonstration for commissioning by Commissioner and Theatre Consultant
3. Installation and instruction to City of New York's representatives

3.4 CONNECTIONS

- A. Provide fasteners as required to provide connection to architectural and structural elements. Coordinate all attachments to adjoining elements with the Construction Manager at a mutually agreed upon time.

3.5 FIELD QUALITY CONTROL

- A. Reviews:

1. Final review will be made by the Commissioner (or his appointed representative), following receipt in writing or notification from the Construction Manager that the installation is completed.
2. If review reveals any detail of construction, fabrication, or installation not in strict accord with the Contract Documents, approval will be withheld and contractor shall be given thirty days (30) to replace the rejected items with those conforming to specification requirements.
3. In addition to the final review of various equipment components the right of review is reserved during the course of the installation. The Commissioner or his appointed representative will be allowed access to materials at the site for eventual incorporation in the work. Preliminary visits will not be construed as eliminating the possible rejection of various components during the final review detailed above.

3.6 DEMONSTRATION AND INSTRUCTION

- A. Provide a total of eight (8) hours of training to the City of New York's representatives.
- B. Contractor shall be expected to demonstrate all configurations indicated in the contract documents.

3.7 ADDITIONAL INFORMATION

- A. See Contract Drawings for quantities and dimensions.

END OF SECTION 11 61 23

SECTION 11 61 43 - PERFORMANCE DRAPERIES AND RIGGING ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the manufacture of Performance Draperies and accessories required for visual masking, and theatrical effect in the following spaces:

- 1. Theatre 1
- 2. Theatre 2

1.3 SECTION INCLUDES:

- A. The Work of this Section includes all labor, materials, equipment and services necessary to provide the performance draperies as shown on the drawings and/or specified herein, including but not necessarily limited to the following:

- 1. Velour Masking Legs, Borders, Tabs and Travelers
- 2. Black Scrim
- 3. White Scrim
- 4. Cyclorama - White Filled Sharktooth Scrim (Leno)
- 5. Masking Panels (ADD/ALT G1)
- 6. Perimeter Panels (ADD/ALT G1)
- 7. Storage Hampers (ADD/ALT G1)
- 8. Storage Bags (ADD/ALT G1)
- 9. Performance Traveler Tracks
- 10. Masking Panel Traveler Tracks
- 11. Perimeter Panel Traveler Tracks
- 12. Loose Rigging Equipment
- 13. Tools (ADD/ALT A)
- 14. Vinyl Surface (Dance floor) (ADD/ALT F)

- B. Related Sections:

- 1. DDC General Conditions
- 2. 11 61 51: Performance Pipe Grid

- C. References

- 1. National Fire Protection Association (NFPA) Standards:
 - a. NFPA701 Standard Methods for Fire Tests for Flame-Resistant Textiles and Films

1.4 SYSTEM DESCRIPTION

- A. Design Requirements:

- 1. Fabricate and install draperies and accessories.

2. Construction shall reflect the standard of care, dimensional, acoustic, and aesthetic requirements specified herein and elsewhere in the Contract.
3. Provide drapes in colors that are exact matches to the reference colors specified. Acceptance of products is dependent upon the ability of the manufacturer to match colors to the satisfaction of the City of New York 's Representative.
4. Masking drapes provided in black shall not shift in color (red) under blue light.

B. Performance Requirements:

1. Construct draperies to withstand and compensate for reasonable variations in environmental conditions, normal wear and tear, and regular usage.
2. Construct draperies so that vertical edges and pleats hang plumb without pulling or turning under.

1.5 QUALITY ASSURANCE

A. Flame-Resistance: Comply with NFPA 701 and applicable local, state, and federal codes.

1. All natural fiber fabrics shall be chemically treated at the mill for flame resistance, using a non-hydroscopic, non-crystalline, permanent agent in an immersion process. Follow manufacturer's recommendations. Materials submitted showing evidence of sprayed flame-retardant are unacceptable. Flame-resistance shall be effective for not less than two (2) years following the date of installation.
2. Inherently flame-resistant (IFR) velour drapery shall be fabricated from 100 percent Trevira complying with NFPA 701.

1.6 SUBMITTALS

A. All submittals shall be in accordance with General and Special Conditions.

B. Data sheets: For storage hampers.

C. Shop Drawings: For fabrication of all draperies.

1. Shop drawings shall be submitted within ninety (90) days of award of contract.
2. Drawings will show all information necessary to explain fully the design features, appearance, function, fabrication, installation, and use of system components in all phases of operation.
3. Fabrication shall not commence until the Consultant has approved shop drawings.
4. All sheets in the submittal shall be of the same size.
5. Submittal shall include a title sheet listing all sheets in the submittal.

D. Samples for Initial Selection: Provide manufacturer's color charts showing the full range of colors available.

E. Provide samples for Verification:

1. Samples of each type of fabric no smaller than 6"x6" in the selected colors, including samples matching Commissioner's sample for custom colors if required

F. Closeout Submittals: Certificates of flame-resistance (or IFR) for all fabrics.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Storage and Protection:

1. Store draperies in dry, humidity-controlled spaces only.
2. Draperies shall not be brought to site or installed until site conditions are approved by the Theatre Consultant / Architect.
3. Protect draperies individually in plastic bags or cardboard cartons. Protect additional items with suitable plastic wrap to protect from damage.

1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions of all draperies by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 WARRANTY

- A. Special Warranty: Warrant systems and equipment to be free of defective components or faulty workmanship for a period of two (2) years from the date of acceptance. Replace items showing evidence of defective materials or workmanship within thirty (30) days after notification. Make replacements without cost to the City of New York .
- B. Designate warranties on manufactured equipment to the City of New York to commence on the date of acceptance.

1.10 MAINTENANCE

- A. Extra Materials:
 1. Furnish extra materials described below that match products provided, are packaged with protective covering for storage, and are identified with typed labels clearly describing contents.
 - a. Provide 10 percent of the total quantity of tie lines and clips.
 - b. Provide three (1) running yards of each fabric type for use as patching.
 - c. Provide container suitable for the long term storage and protection by the City of New York of all extra materials provided under this section. Clearly label container 'Stage Drapery Repair Kit'.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with the requirements, provide products by one of the following manufacturers:
 1. Rose Brand, New York, NY
 2. Stage Decoration & Supplies, Greensboro, NC
 3. Syracuse Scenery and Stage Lighting, Inc., Syracuse, NY
 4. Texas Scenic Company, Frederick, MD
 5. I. Weiss & Son, New York, NY

2.2 MATERIALS

- A. Fabrics: Employ fabrics of one color from the same dye lot with no split widths or mismatched pieces.
- B. 27oz Velour – Performance Drapery: Leg, Border, Tab, Flat Panel , and Traveler:

1. Material: 100% "Trevira", 27 ounce per linear yard based on a 54" width.
2. Color: Black.
3. Accepted Fabric Manufacturers:
 - a. "Prestige", "Charisma", Milliken And Company, Spartanburg, SC

C. Sharkstooth Scrim:

1. Material: 100 percent cotton, flameproofed, 4 ounces per linear yard based on a 30'-0" width.
2. Color: Provide 1 in black and 1 in white each space

D. Cyclorama - White Filled Sharkstooth Scrim (Leno):

1. Material: 100 percent cotton, chemically flame resistant, 4 ounces per linear yard based on a 29'-6" width.
2. Color: As per Drawings and Schedule.

E. Masking Panels (Theatre 1 only)

1. Material: 100 percent wool serge, durable flame retardant, 26 oz per linear yard based on 54" wide width
2. Color: Custom color TBD by Commissioner

F. Perimeter Panels (Theatre 1 only)

1. Material: 100 percent wool serge, durable flame retardant, 24 oz per linear yard based on 54" wide width
2. Color: Custom color TBD by Commissioner

2.3 MANUFACTURED UNITS

A. Spot Blocks:

1. Blocks shall be suitable for anticipated loading and required mounting including attachment method to the pipe grid..
2. Blocks shall be provided with the appropriate sheave as specified herein.
3. The block shall be fitted with a sheave designed for the spotline specified herein.
4. Blocks shall not allow the hoisting rope from leaving the sheave groove. Provide block design to prevent the hoisting rope from leaving the housing in event of sheave, shaft or bearing failure.
5. Provide shafts for sheaves of precision-machined cold finished steel sized to accommodate the sheave bearing and load. Employ a key or wire keeper pin to prevent shafts from rotating. Thread the other end of the shaft and provide a locknut.
6. Provide side plates (cheeks) of steel plate sized for the anticipated load, but not less than 12 gauge (.1046"). Secure side plates to each other with spacer assemblies consisting of bolts, nuts, washers and round tube spacers sized for the load. Arrange spacer assemblies in a configuration to permit anticipated movement of rigging while restraining running lines from escaping sheave grooves. Spacers shall be designed to prevent damage to running lines.

7. Weld side plates to appropriately sized base angles to house the sheave.
8. Align each sheave within the block so that the center and sides of the groove rotate in the same axis perpendicular to the axle and parallel to the side plate. Gap between outer face of sheave and inner face of cheek plate shall be less than $\frac{1}{4}$ ".
9. Loft blocks shall employ steel mounting clips that allow attachment to the pipe grid. Each clip shall fasten with not less than two appropriately sized rated bolts.
10. Cut cheek and draw bolt mountings shall not be used.

B. Performance Traveler Tracks and Masking Traveler Tracks:

1. Provide the performance and masking tracks from heavy-duty channel type track constructed of 14-gauge steel formed to provide parallel double tracks for carrier wheels. Except for the bottom carrier slot, the track shall be totally enclosed. Provide in black finish.
2. Perimeter tracks shall be provided from I beam shaped extrusions, capable of curving as shown in the drawings. Track shall be sized for the loads. Provide in black finish
3. Provide each track assembly from as few pieces as possible, free of burrs, dents and irregularities. Do not exceed 7'-0" on center for the maximum spacing of manufacturer's hanger supports or as recommended by the manufacturer.
4. Provide two master carriers for each track assembly. Each carrier shall be fitted with four neoprene wheels with ball bearings and paired so that two wheels ride in the track on either side of the carrier slot. Provide each carrier with two clamps for attachment of $\frac{1}{2}$ " operating cord and two plated swivels with a 6" trim chain for curtain attachment.
5. Single carriers shall be fitted with two neoprene ball bearing wheels and a "hollow center" design to bypass the $\frac{1}{2}$ " operating line and prevent operating line sag. Provide carriers with single plated swivels with 6" trim chains. Provide two carriers plus one carrier per 1'-0" of track length.
6. All performance tracks shall be provided with rear fold, back pack devices to prevent on-stage "bunching" and provide drapery stacking only at offstage track ends.
7. All Masking Tracks are walk along.
8. All Perimeter Tracks are walk along.
9. For performance tracks, provide heavy-duty type end pulley blocks with 6" diameter sheaves turned and grooved to fit the $\frac{1}{2}$ " operating cord and fitted with sealed ball bearings. Provide blocks to retain the operating cord in sheave grooves. Provide double vertical sheaves on the live end of tracks and a single horizontal sheave on the dead end.
10. Provide end stops and operating cord supports/tie offs at the track ends not fitted with a pulley block. Secure stops to the tracks, and provide with rubber bumpers to reduce "stop noise".
11. Floor pulley block shall have a 6" diameter sheave. Slot the side plates of the floor block to permit vertical adjustment of the sheave to remove up to 14" of slack in the operating line. Provide block with a locking handle to permit sheave adjustment without wrenches

or other tools. Incorporate vinyl sand filled base to tension the block when track is raised and lowered.

12. Provide hardware not specified above but required to provide a properly operating system in accordance with the intent of the Contract Documents.

C. Misc Rigging Equipment

1. Couplers

- a. Provide the following as shown in the schedule on the drawings note some are add alternate and some are base bid:

- 1) Fixed couplers (Cheeseboroughs)
- 2) Swivel couplers
- 3) Half Couplers

- b. All couplers shall be sized for 1.5" diameter pipe with 1100lbs WLL.

- c. All couplers shall be finished Black

- 1) Acceptable Manufacturers:
 - a) The Light Source, Charlotte, NC
 - b) Or approved equal

2. Spot Lines

- a. Spot lines shall be 5/8" 3-strand filament and staple/spun polyester wrapped around fibrillated polyolefin.

- 1) Acceptable: Spectrum Showbraid, Sapsis Rigging, Inc.

D. Pipe Battens

1. Provide pipe battens to the lengths shown in the schedule from 1-1/2" nominal Schedule 40 pipe. Finish black. Provide a 24 "tube sleeved 12" into the batten and welded into one end.

E. Cyclorama and Masking Panel Pocket Battens

1. Provide typical cyclorama pocket battens of 1/2" nominal schedule 40 black steel pipes. Sleeve the pipe with 24" long steel pipe or rod in one end of bottom pipe.
2. Provide masking panel pocket battens of 1/2" nominal Schedule 40 black steel pipes. Size the pipes to fit the width of the masking panels.

F. Vinyl Surface (Dance Floor)

1. Vinyl surface shall be black in color on one side and gray in color on the reverse. Both sides shall be an acceptable surface for performance.
2. Vinyl surface shall be .08" thick.

3. Vinyl surface shall weigh 4.8lbs/yd²
4. Vinyl shall be delivered on PVC cores, minimum 8" in diameter.
5. Vinyl shall be nominal 63" wide.
6. Approved:

- a. American Harlequin, Reversible.
- b. Provide the following quantities:

- 1) 5 rolls 38'-0" nominal
- 2) 1 roll 34'-0" nominal

G. Powered Man Lift

1. Lift shall have working height of 30'-0"
2. Lift shall be AC powered
3. Acceptable Products:
 - a. Genie AWP-30
 - b. Approved equal

2.4 DRAPERY COMPONENTS

- A. Webbing: 3-inch wide nylon or polyester webbing.
- B. Grommets: Number 2 black metal washer grommets unless otherwise noted.
- C. Chain Weights: Zinc plated #8 jack chain sewn into muslin sleeve.
- D. Square Eye Spring Snaps: 1.75" long nickel-plated die cast zinc.

2.5 ACCESSORIES

- A. Tie Lines: Solid braided black "venetian blind" or mason cord NO 4-1/2 (9/64-inch diameter). 18" long
- B. Snap Hooks: Nickel-plated drapery-to-carrier snap fastener.
- C. Storage Bags: Heavy weight canvas bags with dust flap, double thick bottoms and draw-string closure.
- D. Hampers:
 1. Spring steel frame with welded joints, hardwood bottom and wear points reinforced with leather
 2. Four swivel casters with minimum 4" diameter rubber wheels
 3. Heavy weight canvas duck body with riveted seams
 4. Hinged plywood top with top mounted caster stop blocks for stacking hampers
 5. Capacity of 24 bushels.

2.6 FABRICATION

- A. General:

1. All fabric shall be inspected for weaving flaws and imperfections prior to fabrication.
2. Unless specified otherwise herein, sew fabrics with nylon filament thread. Employ matching thread throughout.
3. Unless otherwise specified, sew velour drapes pile up.
4. Construct drapery with the center of the center panel of fabric on the centerline of the drape.
5. Fabricate the drapery panels to run the height of the various sections without horizontal seams. All fabric nap or pile must run in the same direction, unless otherwise specified.
6. Locate grommets in the center of the webbing width so no horizontal stitching is cut or severed. Locate grommets on 1'-0" centers.
7. Double grommet the upper corners of each masking section so that either panel may be used stage left or stage right.
8. Fabricate so that the bottom edge of the face fabric and lining is within 1/4" parallel with the top edge of the drapery, for true hanging across full width.
9. See Equipment and Component Schedule for sizes.

B. Performance Legs, Tabs and Borders:

1. Provide each panel finished to the dimensions indicated on the Schedule.
2. Finish masking draperies without pleats, fullness or linings.
3. Fabricate from 22 ounce black velour.
4. Reinforce tops with webbing and grommets 12" OC and double grommets at both ends.
5. Finish bottoms of legs, tabs and borders with a 6" double turned hem including a #8 canvas duck batten pocket. Seal ends of batten pocket with hook and loop tape. In addition, the bottom of drape shall be weighted with chain weight inserted in the hem and held clear of the bottom of the hem.
6. Finish sides of legs and tabs with a 6" turnback. Finish sides of borders with a 2" turnback.
7. Secure to pipe grid with black 36" NO 4 black cotton tie lines.

C. Black Traveler:

1. Fabricate the traveler from velour in two panels to provide for bi-part action. Finish each panel to the dimensions and fullness indicated on the Schedule.
2. Box pleat at the top in the fullness listed, exclusive of turnback facing. Conceal vertical drapery seams in the box pleats. Sew pleats on the face side of the drapery and reinforce across the top with webbing.
3. Fabricate from 22 ounce black velour.
4. Finish the bottom of the face fabric with a 6" hem. The bottom of drape shall be weighted with chain weight inserted in the hem and held clear of the bottom of the hem.
5. Face back both side edges of each panel with a 6" turnback.
6. Supply the drapery with snap clips and black 36" NO 4 black cotton tie lines for attachment to traveler carriers.

D. Scrim and Cyclorama:

1. Fabricate the scrim from seamless panels of sharktooth scrim finished to the dimensions indicated in the Schedule.
2. Reinforce the top with webbing. Provide zinc plated grommets 12" OC and double grommets at both ends.
3. Finish the bottom with a 4" hem. Include a cotton duck pocket for a 1" I.D. pipe batten, stitched to the top of the hem so as to position the batten 1" above the bottom of the scrim.
4. Finish the sides with a 2" double turned hem with 3/8" stretcher cord inserted within. Reinforce eyelets where stretcher cord exits seam

5. Secure to pipe grid with black 36" NO 4 black cotton tie lines.

E. Masking Panels

1. Provide each panel finished to the dimensions indicated on the Schedule.
2. Finish masking draperies without pleats, fullness or linings.
3. Fabricate from 26 ounce DFR wool serge.
4. Reinforce tops with webbing and grommets 12" OC and double grommets at both ends.
5. Finish bottoms of masking with a 6" double turned hem.
6. Bottom of drape shall be weighted with chain weight inserted in the hem and held clear of the bottom of the hem.
7. Provide Velcro as shown on the drawings on the vertical edges.
8. Finish sides of legs and tabs with a 6" turnback. Finish sides of borders with a 2" turnback.
9. Secure to carriers with black 36" NO 4 black cotton tie lines and square eye spring snaps.

F. Perimeter Panels

1. Provide each panel finished to the dimensions indicated on the Schedule.
2. Finish masking draperies to the fullness indicated in the schedule.
3. Fabricate from 26 ounce DFR wool serge.
4. Reinforce tops with webbing and grommets 12" OC and double grommets at both ends.
5. Finish bottoms of masking with a 6" double turned hem.
6. Bottom of drape shall be weighted with chain weight inserted in the hem and held clear of the bottom of the hem.
7. Provide Velcro as shown on the drawings on vertical edges.
8. Finish sides of legs and tabs with a 6" turnback. Finish sides of borders with a 2" turnback.
9. Secure to carriers with black 36" NO 4 black cotton tie lines and square eye spring snaps.

G. Signage:

1. Mark the centerline of the webbing with permanent marker. Provide a white tie line on the centerline grommet.
2. Provide 2 sets of flame certificates, 1 framed and suitable for hanging and 1 in a sleeve in a binder. Certificate should clearly indicate the date of application, applicator and manufacturer for each drape. The certificate shall have an identifier that clearly indicates which drapery it is associated with.
3. Sew a white fabric label on the upper right and left corners of the webbing of the drape with the following information in the following formats. The label shall be no smaller than 3" x 6" and in no cases should the text size be smaller than 1/8" high.
4. Provide each drapery with a "burn strip" 2" wide sewn into a vertical hem from the floor to a height of 6 feet to allow for NFPA 705 field testing.
 - a. For draperies sewn from material that is flame proofed:

ITEM NAME:
 ITEM NUMBER:
 DIMENSIONS: FULLNESS:
 DATE OF MANUFACTURE:
 DATES OF FLAMEPROOFING: _/ _/ _ _/ _/ _ _/ _/ _
 MANUFACTURED BY:
 THEATRE CONSULTANT:

For draperies sewn from inherently flame-resistant (IFR) material:

ITEM NAME:
 ITEM NUMBER:
 DIMENSIONS: FULLNESS:
 DATE OF MANUFACTURE:
 MANUFACTURED FROM INHERENTLY FLAME-RESISTANT MATERIALS MEETING
 NFPA 701, _____
 MANUFACTURED BY:
 THEATRE CONSULTANT:

- b. List compliance of IFR materials with NFPA 701 and applicable local, state, and federal codes.

2.7 SUPPLEMENTARY

- A. Furnish equipment and hardware in addition to the items specified previously that are necessary to provide a fully working system in conformance with the intent of the Contract Documents.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Examine work prepared by others to receive work of this Section:
 - a. Assure mounting surfaces are ready to accept the Work.
 - b. Verify flatness, plumb, and levelness of mounting conditions.
 - c. Inspect components of the Work to ensure no damage has occurred during shipping or storage.
2. Discrepancies:
 - a. In the event of discrepancies, immediately notify the City of New York 's Representative.
 - b. Do not proceed with the installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 PREPARATION

- A. Verify field measurements at the site prior to installation and modify the system accordingly.
1. Deliver equipment to the site only after the building has been closed in. Coordinate storage at the site and ensure the materials and components are undamaged.
 2. Protect the surrounding environment from damage by the Work.

B. Surface Preparation:

1. Clean surfaces as necessary prior to commencing the Work.

3.3 INSTALLATION

- A. Supervise the installation of drapery as shown on the Drawings or as directed by the Theatre Consultant / Architect or his appointed representative.
- B. Supervise the installation and adjustment of Performance Drapery by the 116133 Contractor.
- C. Hang additional draperies not indicated on the Contract Documents on an available batten per the direction of the Theatre Consultant / Architect for review and acceptance.
- D. Align the center of each border, cyclorama, scrim and traveler with the centerline of the proscenium opening or performance area.

3.4 FIELD QUALITY CONTROL

A. Reviews:

1. Final review will be made by the Commissioner, or his appointed representative following receipt in writing or notification from the Contractor that the installation is completed.

3.5 DEMONSTRATION AND INSTRUCTION

- A. The Contractor shall arrange and demonstrate to the Commissioner that the drapery elements perform per the intent of the Contract Documents prior to acceptance of the drapery.

3.6 EQUIPMENT AND COMPONENT SCHEDULES

- A. See Drawings for drapery, rigging accessories, and dance floor schedules.

B. Tools

1. Provide separate pricing for tools
2. Tools schedule:

TOOLS				
Qty	Equipment	Basis of Design Manufacturer	Basis of Design Make	Notes
1	Compound Miter Saw	Hitachi	C12FDH	
4	Cordless Drill/Driver	Bosch	DDS181-03	
1	Corded Hammer drill	Milwaukee	5378-21	
1	Circular Saw	Milwaukee	6394-21	
1	Angle Grinder	Milwaukee	6117-30	
1	Router	Porter Cable	892	
2	Palm Sanders	Porter Cable	342	
1	Drill Press	Delta	18-900L	18 inch laser guide press
1	Pipe Threader / Base	Rigid	12-R Pipe Thread Kit	
1	Nico-Press Swager	McMaster-Carr	3582T1	
1	Flammables Cabinet	McMaster-Carr	4495T2	Full height with self-closing doors
1	Shop Vacuum	Shop-Vac	960-99-10	
1	Abrasive Chop saw	DeWalt	D28710	

1	Bench Grinder	JET	577102	
1	Air Compressor	Porter Cable	25 Gal Portable C6101	
1	NC stapler	Porter Cable	NS150B	
1	Framing Nailer	Porter Cable	FR350A	
2	Fiberglass Step Ladder	McMaster-Carr	8089T33	6'-0" high double sided
1	Fiberglass Step Ladder	McMaster-Carr	8089T35	8'-0" high double sided
2	Fiberglass Step Ladder	McMaster-Carr	8136T15	10'-0" high
1	Fiberglass Step Ladder	McMaster-Carr	8136T16	12'-0" high

END OF SECTION 11 61 43

SECTION 11 61 51 - PERFORMANCE PIPE GRID

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. The pipe grid consists of a matrix of perpendicular; intersecting steel pipes suspended from overhead structure. The grid shall provide serviceable hanging locations for performance lighting and masking drapery.
- B. Section Includes:
 - 1. Materials, components, modifications, assemblies, equipment and services as specified herein. These include, but are not limited to:
 - a. Verification of site dimensions and conditions
 - b. Submittals as required by the Contract Documents
 - c. Submission of Shop Drawings signed and sealed by a licensed Professional Engineer experienced in work of similar nature and scope
 - d. Engineering of equipment and systems as required by the Contract Documents
 - e. Manufacture of equipment and systems as required by the Contract Documents
 - f. Scheduling, sequencing and coordination with other trades
 - g. Site supervision of equipment and systems installation specified herein and elsewhere in the Contract Documents
 - h. Testing and demonstration of equipment and systems as specified herein and elsewhere in the Contract Documents
- C. Provide systems for the following spaces:
 - 1. Theatre 1
 - 2. Theatre 2
 - 3. Theatre 2 Lobby
- D. Steel pipe grid, including:
 - 1. Connection to structure
 - 2. Vertical uprights connected to structure above for mounting of miscellaneous boxes, including performance lighting boxes
 - 3. Connections, components, labor and elements necessary to complete the system as specified in the Contract Documents
 - 4. Finish paint to be black in theatre spaces and TBD by architect in lobby.
- E. Strong points, including:
 - 1. Connection to structure
 - 2. Size components for loads indicated.
 - 3. Resist lateral loads of up to 1/2 vertical loads.
- F. Related Sections:

1. Division 1: General and Supplementary Requirements
2. Division 5: Metals
3. Division 11: Equipment:
4. Division 26: Electrical:
5. Performance Dimmers and Receptacles

1.3 SYSTEM DESCRIPTION

A. Performance Requirements:

1. The following is to establish minimum safety requirements for the system. Where Federal, State and Local Legislation address these topics, the more stringent requirement takes precedence. Factors listed below in no way relieve this Contractor from sole responsibility of providing a safe system.
2. Maximum Allowable Deflection: 1/200th of span.
3. Pipe Live Load: 30 plf.
4. System Lateral Load: 250 p concentrated.
5. Strong point total load: as indicated in drawings.
6. Provide assemblies, cable components, connections, equipment, hardware and linkages employed in supporting, in whole or in part, overhead loads that are rated and designed for that application. Base loading for each component on the maximum percentage of the capacity of the system in which the component is employed, in addition to a 25% impact factor.
7. Provide systems designed to reflect safeguards and precautions related not only to normal use of the equipment under ideal operating and loading conditions but, additionally, to anticipate equipment misuse, human error, and misjudgment. Design and intent parameters set forth herein in no way relieve this contractor from responsibility or liability arising from the Work.

1.4 SUBMITTALS

- #### A. All submittals shall be in accordance with Division 1: General and Special Conditions. All submittals shall be submitted in a timely manner, allowing sufficient time for adequate review and possible re-submittal without jeopardizing the project schedule.
- #### B. Shop Drawings – Pipe Grid:
1. Shop drawings shall be submitted within ninety (90) days of award of contract.
 2. Shop drawings, product data sheets and samples shall be submitted in accordance with DDC General Conditions.
 3. All submittals shall be complete. No partial submittals shall be allowed without the Theatre Consultant's prior written consent.
 4. Drawings will show all information necessary to explain fully the design features, appearance, function, fabrication, installation and use of system.
 5. Engineering studies, calculations, models and reports shall be made part of the shop drawing submittal.
 6. Fabrication, installation and erection shall not commence until shop drawings have been reviewed by the Theatre Consultant and Commissioner.
 7. All sheets in the submittal shall be of the same size.
 8. Submittal shall include a title sheet listing all sheets in the submittal.
 9. Shop drawings shall be stamped by a professional structural engineer licensed in the state of New York.
 10. Include diagrams depicting the system layout and maximum load limitations (drawn not less than 1/4" = 1'-0").

11. Submit files on standard pc format CD clearly labeled including project name, project architect, theatre consultant, contractor name, date of submittal. Reduced size, 11x17 preferred, hardcopy prints
12. Universal electronic format files, .pdf file type is preferred, as full size printable sheets.
13. In addition to the requirements referenced above, provide record copy shop drawings for archival and reference usage as part of the O & M manuals:

1.5 QUALITY ASSURANCE

- A. Contractor: A firm with a minimum of three years experience in the type of work required by this section.
- B. Installers: Skilled technicians who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and best industry practices for the proper installation of the work.
- C. Welders: Certified welders who are thoroughly trained and experienced in the required welding procedures and who are completely familiar with the specified requirements and best industry practices for the proper installation of the work.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions of all work by field measurements before fabrication and indicate measurements on Shop Drawings.
- B. Coordinate work in this section with other trades.

1.7 WARRANTY

- A. Special Warranty:
 1. Warrant systems and equipment to be free of defective components, faulty workmanship or improper adjustment for a period of one year from the date of City of New York's acceptance. Paint and exterior finishes are excluded. Replace items showing evidence of defective materials or workmanship (including installation workmanship) within thirty (30) days after notification. Make replacements without cost to the Owner. Rectify conditions that might present a hazard to human life, well-being and or property within forty-eight (48) hours of notification.
- B. Designate warranties on manufactured equipment to the City of New York on the date of system acceptance.

1.8 WARRANTY SERVICE

- A. Warranty Service:
 1. Provide warranty service for a period of one year after final acceptance of the installation. This service consists of at least two (2) half-yearly visits to the site for checking and adjusting of equipment. Perform the first visit six (6) months after the system has been accepted. Arrange visit to be at a time mutually agreeable to the City of New York and Contractor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide the Systems from components (except where otherwise stated) that are the products of one of the following suppliers:
1. J.R. Clancy, Inc., Syracuse, NY
 2. Pook Diemont and Ohl, Bronx, NY
 3. SECOA, Champlain, MN
 4. Texas Scenic Company, San Antonio, TX

2.2 MATERIALS

- A. Pipe:
1. 1-1/2" nominal Schedule 40 Seamless Black Steel Pipe (1.90" o.d.)
- B. Internal pipe sleeves:
1. 1-1/2" o.d. round mechanical steel tubing with 5/32" wall thickness
- C. Strong Points:
1. Fabricate from steel as shown in the drawings
 2. Engineer components for loads shown
 3. Secure to structure using a minimum 8:1 design factor for anchorage.
- D. Finishing:
1. Paint formed steel parts, attachment hardware and grid pipes matte black.

2.3 MANUFACTURED UNITS

- A. Provide grid pipe lengths as depicted on the Drawings. Incorporate full pipe sections as required with only one partial section for lengths longer than 21'-0".
- B. Provide typical grid pipe of 1 1/2" nominal (1.9" O.D.) Schedule 40 seamless black steel pipe. Join pipe sections with 18" splice sleeves extending 9" into each pipe and held by two 3/8" hex bolts and lock nuts on each side of the joint.
- C. Provide attachments at grid pipe ends as required to prevent lateral grid movement.
- D. Provide hangers as required but not to exceed 10'-0" on center in either axis. Provide strut secured to slab above to support hangers as shown in the drawings or other structurally approved means to suspend the hangers from the slab. Coordinate with structure above, other services (sprinklers, mechanical, lighting etc) and finished ceiling construction. See architectural drawings for details.
- E. Pipes shall be coped and welded at all intersections forming a uniform level surface of finished grid with all pipes in a single plane.

2.4 SUPPLEMENTARY

- A. Furnish equipment and hardware in addition to the items specified previously that are necessary to provide a fully working system in conformance with the intent of the Contract Documents.
- B. Signage:
 - 1. Provide signage legible both in construction and grammar. Provide sign surfaces and characters textured or otherwise treated to minimize glare and veiling reflectance.
 - 2. Wall mount diagrams depicting the system layout and maximum load limitations (drawn not less than 1/4"=1'-0") in a protective transparent faced frame as directed by the Design Consultant
 - 3. Provide an engraved black lamacoid plaque, with white characters 3/8" as directed by the Design Consultant. List on the plaque the loading capacity of the Grid. Engrave a warning on the plaque cautioning against access by unauthorized and untrained personnel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
 - 1. Examine work prepared by others to receive work of this Section and report defects affecting installation to the General Contractor for correction. Commencement of the work shall be construed as complete acceptance of preparatory work by others. The sphere of inspection includes but is not limited to:
 - 2. Assurance mounting surfaces are ready to accept the Work
 - 3. Verification of flatness, plumb and level of mounting conditions
 - 4. Inspection of components of the Work to ensure no damage has occurred during shipping or storage
 - 5. Discrepancies:
 - 6. In the event of discrepancies, immediately notify the Theatre Consultant.
 - 7. Do not proceed with the installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 PREPARATION

- A. Verify field measurements at the site prior to installation and modify the system accordingly.
 - 1. Deliver equipment to the site only after the building has been closed in. Coordinate storage at the site and ensure the materials and components are undamaged.
 - 2. Protect the surrounding environment from damage by the Work.
- B. Surface Preparation:
 - 1. Clean surfaces as necessary prior to commencing the Work.

3.3 ERECTION, INSTALLATION AND APPLICATION

- A. Install pipe grid system as shown on the Drawings. Make necessary adjustments and modifications to insure successful installation.
- B. Provide touch up painting of all parts at completion of installation.

3.4 FIELD QUALITY CONTROL

A. Reviews:

1. Final review will be made by the Theatre Consultant / Architect or their appointed representative, following receipt in writing or notification from this Contractor that the installation is completed. If review reveals details of construction, fabrication, or installation not in strict accord with the Specification and Contract requirements, approval will be withheld and Contractor shall be given thirty (30) days to replace the rejected items with those conforming to specification requirements. In addition to the final review of various equipment components the right is reserved to inspect during the course of the installation, and to be allowed access to materials at the site for eventual incorporation in the work. Preliminary inspection will not be construed as eliminating the possible rejection of various components during the final inspection detailed above.
2. The completed installation, properly installed, shall be load tested for the acceptance by the Theatre Consultant by the Rigging Contractor prior to acceptance.

END OF SECTION 11 61 51

SECTION 11 61 91 - PERFORMANCE LIGHTING INSTRUMENTS AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Work in this section includes manufacture and furnishing of performance lighting instruments and accessories for:
 - 1. Theatre 1
 - 2. Theatre 2
- B. Section Includes:
 - 1. Materials, components, modifications, assemblies, equipment and services as specified herein. These include, but are not limited to:
 - a. Stage lighting instruments
 - b. Stage lighting accessories
 - c. Loose electrical distribution
 - d. Fixture assembly, lamping, bench focusing, and removal and disposal of packing materials

1.3 GENERAL DESCRIPTION

- A. Performance Requirements:
 - 1. Provide electrical equipment listed and labeled for use as indicated by UL or other independent test agency acceptable to the Code Authority or jurisdiction.
 - 2. Provide lamps and lighting instruments to operate from 120 volt 60Hz AC, unless otherwise stated.
 - 3. Lighting Instruments:
 - a. Provide each lighting instrument with a C-clamp, black safety cable, specified lamp, power cable fitted with the specified grounded stage plug and two (2) black color frames, unless otherwise stated.
 - b. Provide lighting instruments with operating knobs and handles safe to touch for precise operation at all times.
 - c. Provide instruments allowing a simple method of lamp replacement without dismantling lighting instrument. No tools are required for lamp replacement.
 - d. Provide space for fitting up to two (2) color filters in removable frames in each lighting instrument.
 - e. Provide a slot on ellipsoidal spotlights for insertion of an iris or template holder.
 - f. Provide focus adjustment of ellipsoidal spotlights from a sharp edge beam to a soft edge beam without stray light rays or extraneous internal reflections from the lens tube.
 - g. Provide each lighting instrument with a standard length of not less than three (3) feet, 3 conductor cable and grounded stage connector as specified.
 - h. Securely ground metalwork of lighting instruments.

- i. Unless specified herein, fans for forced ventilation of lighting instruments are not acceptable in any lighting instruments except effects projectors, followspots, or special units and then only with written agreement from the City of New York.
- j. Ventilate lighting instruments for the maximum designed lamp wattage such that no reduction in rated lamp life or deterioration of the component parts of the lights instruments may be attributed to overheating.

1.4 SUBMITTALS

- A. All submittals shall be in accordance with DDC General Conditions. All submittals shall be submitted in a timely manner, allowing sufficient time for adequate review and possible resubmittal without jeopardizing the project schedule.
- B. Shop Drawings and Catalog Cuts:
 1. Drawings and Catalog Cuts will show all information necessary to explain fully the design features, appearance, function, fabrication, installation and use of system components in all phases of operation.
 2. Fabrication shall not commence until the Theatre Consultant and Commissioner have approved shop drawings.
 3. All sheets in the submittal shall be of the same size.
 4. Submittal shall include a title sheet listing all sheets in the submittal.
- C. Record Drawings and Maintenance Manuals:
 1. Organize operating and maintenance manuals into suitable sets of manageable size.
 2. Bind data into individual binders for each manual, properly identified on front and spine. For large manuals, provide and index sheet and thumb tabs for separate information categories.
 3. Provide heavy-duty 3-ring vinyl-covered binders, 1" to 2" thick as required to contain information, sized for 8-1/2" x 11" paper with inside pockets or pocket folders for folded sheets.
 4. Operations and Maintenance Manuals shall include:
 - a. Contact information for Theatre Performance Lighting Instruments and pertinent manufacturers
 - b. Safety and Operational Instructions
 - c. Complete parts and subassembly list
 - d. Wiring diagrams
 - e. Periodic Maintenance Schedule
 - f. A maintenance procedure for finishes
 - g. Records of final testing and log
 - h. Spare parts list and source information

1.5 QUALITY ASSURANCE

- A. Source: To the extent permitted by the product specifications, provide products and accessory components of one manufacturer for each instrument type required for the work of this section.
- B. Contractor: A firm with a minimum of three years experience in the type of work required by this section.
- C. Installers: Skilled technicians who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and best industry practices for the proper installation of the work.

1.6 WARRANTY

A. Special Warranty:

1. Warrant fixtures and equipment to be free of defective components or faulty workmanship for a period of one (1) year from the date of acceptance. Replace items showing evidence of defective materials or workmanship (including installation workmanship) within thirty (30) days after notification. Make replacements without cost to the City of New York.
- B. Designate warranties on manufactured equipment to the City of New York on the date of acceptance.

PART 2 - PRODUCTS

2.1 LIGHTING INSTRUMENTS

A. General:

1. Supply all fixtures with the following components:
 - a. Specified lamp by General Electric, Osram Sylvania, or Phillips
 - b. Clamp: Standard accessory product by spotlight manufacturer, Altman 510, or approved equal.
 - c. Two (2) black OEM color frames (with the exception of striplights):
 - d. Two pin and ground stage connector of an amperage appropriate for anticipated loads and complying with UL498
 - e. Safety Cable: Standard accessory product by spotlight manufacturer or approved equal black in color. (Two for striplights)
2. Supply all ellipsoidal framing spotlights with the following components:
 - a. Template holder: Provide 15% of total fixtures. Standard accessory product by spotlight manufacturer or approved equal.
 - b. Top Hat: Provide 10% of total fixtures standard accessory product by spotlight manufacturer or approved equal.
 - c. Half Hat: Provide 10% of total fixtures standard accessory product by spotlight manufacturer or approved equal.
 - d. Lens Tubes: Provide quantity of one (1) for each degree ellipsoidal spotlight specified.
 - e. Donuts: Provide 10% of total ellipsoidal fixtures. Standard accessory product by spotlight manufacturer.
3. Supply all Fresnel spotlights with the following components:
 - a. Barndoor: Standard accessory product by spotlight manufacturer or approved equal.
4. Supply all LED par units with the following components:
 - a. Barndoor: Standard accessory product by spotlight manufacturer or approved equal.
 - b. Top Hat: Provide 50% of total fixtures standard accessory product by manufacturer or approved equal

- c. Additional Power Cables: Provide 20% of total fixtures with additional power cables
5. Supply all LED striplights with the following components:
- a. Floor trunions: Standard accessory product by spotlight manufacturer or approved equal.
 - b. Hanging irons: Standard accessory product by spotlight manufacturer or approved equal.
 - c. Clamp: Standard accessory product by spotlight manufacturer, Altman 510, or approved equal.
 - d. Additional Power Cables: Provide 20% of total fixtures with additional power cables
 - e. Pass-Through Power Cables: Provide 120% of total fixtures with pass-through power cables utilizing powercon connectors no longer than 18" in length.
 - f. Complete range of optical lens kits available for adjustment of light beam.
- B. Ellipsoidal Framing Spotlight:
1. Fixed Angle 19 Degrees
 2. Minimum performance with 575w, 2000 hr, 3,050°K lamp
 - a. Cut off angle: 19 Degrees \pm 2 degrees.
 - b. Peak intensity at beam angle (50%): 66 footcandles minimum at 50 feet.
 3. Acceptable Products:
 - a. Electronic Theatre Controls Source Four #419
 - b. Strand Lighting Leko Lite 11520C
- C. Ellipsoidal Framing Spotlight:
1. Fixed Angle 26 Degrees
 2. Minimum performance with 575w, 2000hr, 3,050°K lamp
 - a. Cut off angle: 29 Degrees \pm 3 degrees.
 - b. Peak intensity at beam angle (50%): 95 footcandles minimum at 40 feet.
 3. Provide Recital Hall fixtures in White finish.
 4. Acceptable Products:
 - a. Electronic Theatre Controls Source Four #426
 - b. Strand Lighting Leko Lite 11530C
- D. Ellipsoidal Framing Spotlight:
1. Fixed Angle 36 Degrees
 2. Minimum performance with 575w, 2000hr, 3,050°K lamp
 - a. Cut off angle: 37 Degrees \pm 4 degrees.
 - b. Peak intensity at beam angle (50%): 97 footcandles minimum at 30 feet.
 3. Provide Recital Hall fixtures in White finish.
 4. Acceptable Products:
 - a. Electronic Theatre Controls Source Four #436
 - b. Strand Lighting Leko Lite 11540C

E. Ellipsoidal Framing Spotlight:

1. Fixed Angle 50 Degrees
2. Minimum performance with 575w, 2000hr, 3,050°K lamp
 - a. Cut off angle: 50 Degrees \pm 4 degrees.
 - b. Peak intensity at beam angle (50%): 97 footcandles minimum at 30 feet.
3. Acceptable Products:
 - a. Electronic Theatre Controls Source Four #450
 - b. Strand Lighting Leko Lito 11550C

F. 6" Fresnel, 750w:

1. Minimum performance with 750w, 500hr, 3,050°K lamp
 - a. Adjustable beam angle between 10° and 50°
 - b. Peak intensity at spot beam angle: 100 footcandles at 30 feet
 - c. Peak intensity at flood beam angle: 10 footcandles at 30 feet
2. Acceptable Products:
 - a. Altman #65Q
 - b. Strand Lighting Rama PC and Fresnel

G. LED Par/Fresnel:

1. LED fixture utilizing RGB color mixing to produce a uniform field of light.
2. Optical control for spot to flood adjustment may be motorized zoom controlled via DMX or lensing. Provide complete lens kit for each fixture.
3. Luminaires shall utilize PowerCon connectors with a 24" tail for power input.
4. Data input shall be DMX512 5-pin with DMX pass through.
5. LED life shall be rated for 25,000 hours to half output.
6. Acceptable Product:
 - a. Chauvet COLORado 1 Tri Tour [RGB]
 - b. Elation Design Par LED Par Zoom [RGB]
 - c. Electronic Theatre Controls Vivid-R [ROAGCBI]
 - d. ChromaQ ColorForce 12 [RGBA]

H. LED Striplight

1. Linear LED fixture utilizing RGB color mixing to produce a uniform field of light.
2. Nominal dimensions shall be no larger than 70" x 8" x 9"
3. Luminaires shall utilize PowerCon connector with 36" tail for power input with pass through connection.
4. Data input shall be DMX512 5-pin with DMX pass through.
5. LED life shall be rated for 25,000 hours to half output.
6. Luminaire shall allow for Hue, Saturation, Intensity control.
7. Trunions or hanging bracks shall integrated cable clip.
8. Acceptable Products:
 - a. ChromaQ Color Force [RGBA]
 - b. Electronic Theatre Controls Vivid-R [ROAGCB]

I. Blue Light

1. Fixed angle 10 degrees
2. Output .2 footcandles at floor level from a projection distance of 14'-0"
3. Color of light shall be blue
4. Mounting
 - a. Fixture shall be mounted to a 2 gang standard metal conduit box
 - b. Conduit box shall be mounted to a bent steel plate
 - c. Steel plate shall be attached to a standard C-clamp (see section 3.6)
5. Acceptable Products:
 - a. Global Design Solutions Blues System BlueBeam 10°

2.2 ACCESSORIES

A. Side Arms:

1. Provide 18" sidearms consisting of 18" length of 1/2" black pipe with an adjustable c-clamp affixed to one end and one (1) slide tee mounted to pipe for luminaire or equipment attachment.
 - a. Acceptable Products:
 - 1) Altman Lighting 509-18-1

B. Pipe Booms:

1. Provide 15'-0" pipe booms fabricated from three (3) 5' sections of 1-1/2" nominal, 1.90" o.d. schedule 40 black pipe with 50lb. cast iron boom base and boom tie off. To protect pipe threads during storage, provide end caps for each section of pipe.

C. Drop-in iris and template holders:

1. Standard accessory product by spotlight manufacturer

2.3 CABLE

A. All connectors are two-pin and ground stage connectors of appropriate ampacity, complying with UL 498.

B. All cable is to be properly labeled for Length. Protect all labels with Clear heat shrink cover.

C. Stage Cable:

1. Jumper Cable - 20amp:
 - a. Provide 20 amp cables with 3 core, No. 12, type SO, or approved equal, with 20-amp stage male connector at one end and matching female connector at the other end. Lengths as specified.
2. Jumper Cable - 50amp:

- a. Provide 50 amp cables with 3 core, No. 8, type SO, or approved equal, with 50-amp stage male connector at one end and matching female connector at the other end. Lengths as specified.
3. Acceptable Manufacturers:
 - a. Lex Products
 - b. TMB Associates
- D. MultiConductor:
 1. Multiconductor Extension:
 - a. Provide 6 circuit, 20 amp, type SO or Procable multicable with offset eye, closed mesh, single weave support grips, uniquely numbered ends and Veam VSC male/female multiconnectors as per drawings and schedule. Multicable shall be minimum 12AWG.
 2. Multiconductor Break-Out:
 - a. Provide 6 circuit, 20 amp, type SO or Procable, break-out with Veam VSC male multiconnector and 20 amp grounded stage female connectors. Stagger cable lengths per drawings and schedule.
 3. Multiconductor Fan-In:
 - a. Provide 6 circuit, 20 amp, type SO or Procable, fan-in with Veam VSC female multiconnector and 20 amp grounded stage male connectors. Cable lengths per schedule.
 4. Acceptable Manufacturers:
 - a. Lex Products
 - b. TMB Associates
- E. Branchoffs and Twofers:
 1. Twofer:
 - a. Provide 20 amp male stage connector and two (2) 20 amp female stage connectors wired in molded assembly. Pigtail lengths to be not less than 1'6".
 2. 60amp To 20 amp Protected Branchoff:
 - a. Provide 60 amp male stage connector and three (3) 20 amp female stage connectors wired with 3'-0" No. 12 type SO cables, provide 20amp circuit breakers on each branch.
 3. Acceptable Manufacturers:
 - a. Lex Products
 - b. TMB Associates

2.4 SPARES**A. Lamps:**

1. Provide all other fixture types with 25% spare lamps, but provide not less than two lamps of each type.

B. Safety Cable:

1. Provide 10% spare black safety cables for each type of safety cable.

C. C-clamp:

1. Provide 10% spare C-clamps for each type of instrument.

2.5 SUPPLEMENTARY

- A. Furnish equipment and hardware in addition to the items specified previously that are necessary to provide a fully working system in conformance with the intent of the Contract Documents.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine areas where performance lighting instruments are to be mounted or otherwise installed and verify that conditions are satisfactory for installation and comply with manufacturer's requirements and those specified in this section.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Contractor shall inventory, unpack and set up all equipment. Install performance accessories where applicable, in accordance with manufacturer's written instructions and with recognized industry practice to ensure that performance lighting equipment complies with applicable requirements of NEC and UL standards.
 1. Lamp all fixtures, test and bench focus all ellipsoidals, test and align all followspots, and lamp and test all other fixtures.
 2. Mount followspots in locations as directed.
 3. Store fixtures as directed.
 4. Dispose of all packing material.

3.3 FIELD QUALITY CONTROL

- A. Provide or facilitate the following tests or inspections. Correct deficiencies and retest deficient items.
- B. Visual and Mechanical Inspections: Include the following:
 1. Inspect each spotlight and other loose items of equipment for defects, failure, corrosion, physical damage, and labeling as required.
 2. Exercise and perform operational tests on mechanical parts and operable devices according to manufacturer's instructions or routine functional operation.

C. System Commissioning:

1. Upon completing installation, other tests, and manufacturer's check-out, schedule an inspection and operating test with the Commissioner and Theatre Consultant. Facilitate such tests as may be required to ensure that all equipment is in compliance with the intent of the specification.
2. Comply with the following conditions required for commissioning:
 - a. All handover and loose equipment provided under this section to be on site and available for testing.
 - b. Provide full and uninterrupted access to stage, auditorium, and technical areas required for commissioning tests. Blackouts of lighting will be required.
 - c. Contractor's project representative to be present during tests as required.
 - d. Provide personnel to operate equipment and perform adjustments as necessary.
 - e. Provide access equipment as required.
 - f. Provide walkie-talkie or other communication devices as required.
 - g. Provide a male Edison to female pin adaptor so fixtures can be hot tested from convenience outlets in the theatre.

3.4 ADJUSTING AND CLEANING

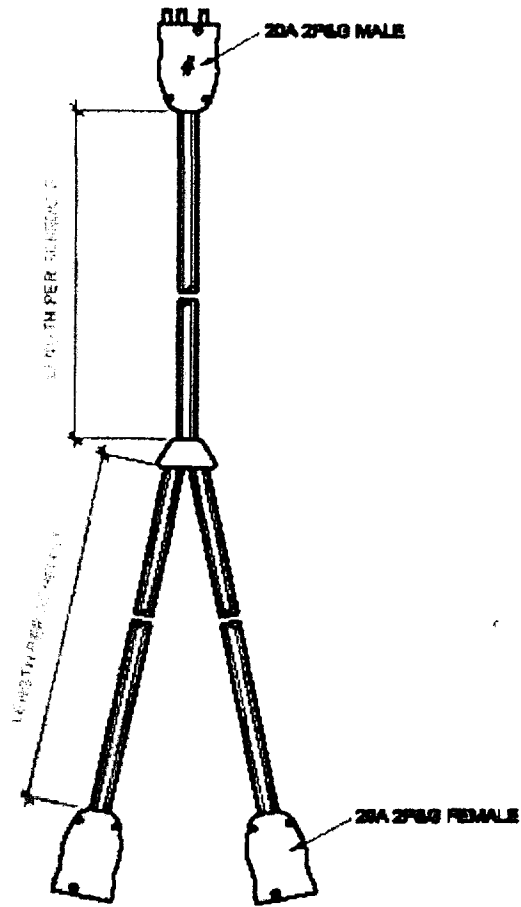
- A. Clean performance lighting equipment of dirt and debris using methods and materials as recommended by manufacturers upon completion of installation.
- B. Protect installed performance lighting equipment and lamps during remainder of construction period.

3.5 DEMONSTRATIONS AND INSTRUCTION

- A. Provide the services of a qualified manufacturer's representative to provide a minimum of two (2) hours of training in the operation and maintenance of the followspot equipment specified herein. Training sessions shall consist of one (1), two (2) hour session at times separate from the check out of the system. Training time shall be arranged for the convenience of City of New York's personnel, and shall take place during the first six (6) months after building acceptance.

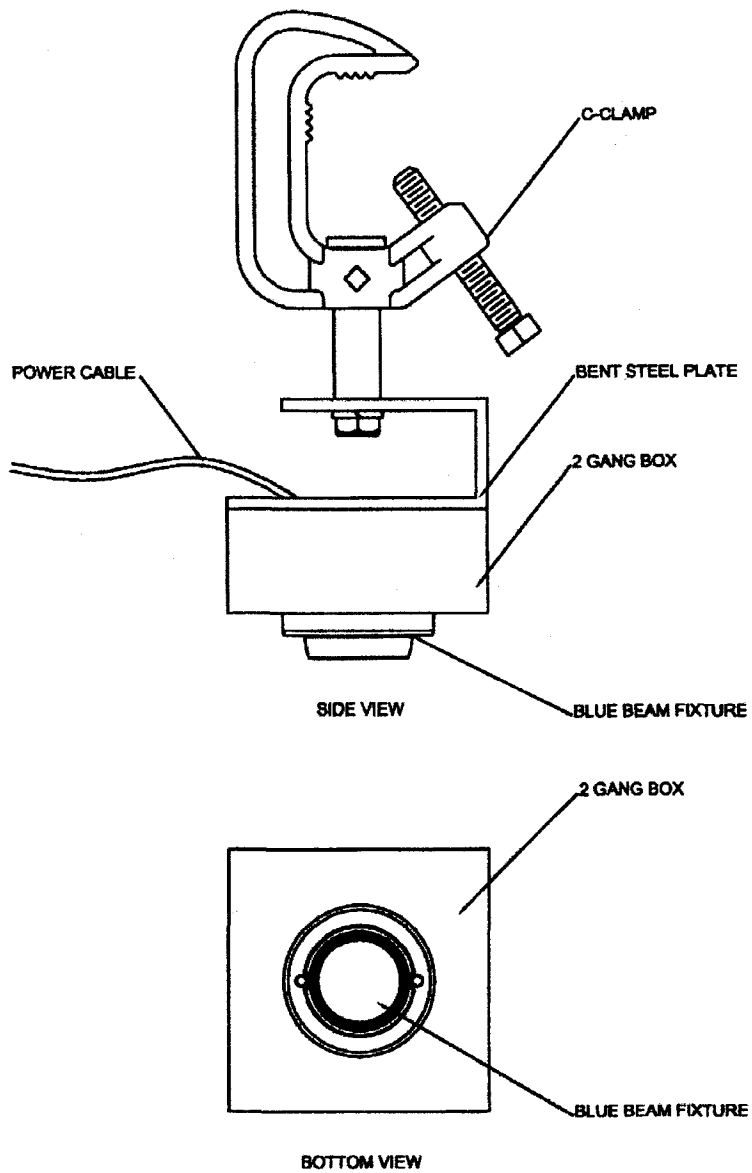
3.6 DETAILS

A. Two-Fers



PROVIDE QUANTITIES PER
SPECIFICATION SCHEDULE

B. Blue Light



PROVIDE QUANTITIES PER
SPECIFICATION SCHEDULE

C. EQUIPMENT LIST

THEATRE 1

<u>Qty.</u>	<u>Equipment</u>	<u>Basis of Design Manufacturer</u>	<u>Basis of Design Model</u>	<u>Notes</u>
4	19 Degree ellipsoidal	ETC	Source 4	
6	26 Degree ellipsoidal	ETC	Source 4	
32	36 Degree ellipsoidal	ETC	Source 4	
6	50 Degree ellipsoidal	ETC	Source 4	
12	Top hats for 19 thru 90 degree ellipsoidals	City Theatrical	Stacker	
12	Half hats for 19 thru 90 degree ellipsoidals	City Theatrical	Stacker	
24	Donut for ellipsoidal	City Theatrical	2250	
2	Drop-in iris	City Theatrical	2180	
12	Template holders for ellipsoidal	City Theatrical	S4A	
12	Template holders for ellipsoidal	City Theatrical	S4B	B pattern
72	Standard color frame	Approved by manufacturer		
12	Spare lens tube (19deg)	ETC	Source 4	
12	Spare lens tube (26deg)	ETC	Source 4	
12	Spare lens tube (36deg)	ETC	Source 4	
12	Spare lens tube (50deg)	ETC	Source 4	
6	PAR EA	ETC	Source 4	
8	6" Quartz Focusing Fresnel	Altman	65Q	
		Selecon	RAMA	
8	6" Barndoor (4-way)	Approved by manufacturer		
46	3 Color LED PAR replacement	Chauvet	COLORado 1 Tri-Tour	
		Elation	Design PAR LED PAR zoom	
		ETC	Vivid-R	
		Chroma Q	Color Force 12	
20	LED PAR replacement	ETC	Desire	
		Altman	Spectra PAR	
6	LED Striplight	AC Lighting	ChromaQ	
14	Portable houselight fixture	GDS	BlueBeam 10 deg with K2 lamp	
150	Safety cables			
10	Sidearms 18"	Altman	509-18-1	

20	Sidearms 12"	Altman	509-18-1	
90	C-clamps	Altman		
8	12'-0" x 1.5" id steel pipe schedule 40			
8	Boom tie-off rings	City Theatrical	1310	
8	1.5" pipe flange	Altman		
6	50lb stationary lighting base	Altman	B-50	
20	Twofer - 20 amp (molded)	LEX or equal		
10	Threefer - 20 amp (molded)	LEX or equal		
10	50 amp to 20 amp branchoff	LEX or equal		
20	Jumper cable - 20 amp - 5'	LEX or equal		
20	Jumper cable - 20 amp - 10'	LEX or equal		
15	Jumper cable - 20 amp - 25'	LEX or equal		
8	Jumper cable - 20 amp - 50'	LEX or equal		
15	10' DMX extension (5-Pin)	LEX or equal		
8	25' DMX extension (5-Pin)	LEX or equal		
8	50' DMX extension (5-Pin)	LEX or equal		
2	Gobo rotator	Apollo	Smart Move Rotator	
20 0	Spare HPL 575w	OSRAM, GE, Phillips		

THEATRE 2

<u>Qty.</u>	<u>Equipment</u>	<u>Basis of Design Manufacturer</u>	<u>Basis of Design Model</u>	<u>Notes</u>
4	19 Degree ellipsoidal	ETC	Source 4	
3	26 Degree ellipsoidal	ETC	Source 4	
32	36 Degree ellipsoidal	ETC	Source 4	
6	50 Degree ellipsoidal	ETC	Source 4	
10	Top hats for 19 thru 90 degree ellipsoidals	City Theatrical	Stacker	
10	Half hats for 19 thru 90 degree ellipsoidals	City Theatrical	Stacker	
11	Donut for ellipsoidal	City Theatrical	2250	
2	Drop-in iris	City Theatrical	2180	
12	Template holders for ellipsoidal	City Theatrical	S4A	A pattern
12	Template holders for ellipsoidal	City Theatrical	S4B	B pattern
68	Standard color frame	Approved by manufacturer		
8	Spare lens tube (19deg)	ETC	Source 4	
8	Spare lens tube (26deg)	ETC	Source 4	

8	Spare lens tube (36deg)	ETC	Source 4	
8	Spare lens tube (50deg)	ETC	Source 4	
4	PAR EA	ETC	Source 4	
8	6" Quartz Focusing Fresnel	Altman 65Q	or Selecon Rama 16RAFR6	
8	6" Barndoor (4-way)	Approved by manufacturer		
46	3 Color LED PAR replacement	Chauvet	COLORado 1 Tri- Tour	
		Elation	Design PAR LED PAR zoom	
		ETC	Vivid-R	
		Chroma Q	Color Force 12	
20	LED PAR replacement	ETC	Desire	
		Altman	Spectra PAR	
5	LED Striplight	AC Lighting	ChromaQ	
90	Safety cables			
10	Sidearms 18"	Altman	509-18-1	
10	Sidearms 12"	Altman	509-18-1	
90	C-clamps	Altman		
6	12'-0" x 1.5" id steel pipe schedule 40			
6	Boom tie-off rings	City Theatrical		
6	1.5" pipe flange	Altman		
6	50lb stationary lighting base	Altman	B-50	
10	Twofer - 20 amp (molded)	LEX or equal		
10	Threefer - 20 amp (molded)	LEX or equal		
5	50 amp to 20 amp branchoff	LEX or equal		
10	Jumper cable - 20 amp - 5'	LEX or equal		
18	Jumper cable - 20 amp - 10'	LEX or equal		
15	Jumper cable - 20 amp - 25'	LEX or equal		
8	Jumper cable - 20 amp - 50'	LEX or equal		
15	10' DMX extension (5-Pin)	LEX or equal		
8	25' DMX extension (5-Pin)	LEX or equal		
8	50' DMX extension (5-Pin)	LEX or equal		
2	Gobo rotator	Apollo	Smart Move Rotator	

20 0	Spare HPL 575w	OSRAM, GE, Phillips		
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SECTION 122413 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide roller shades in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Roller shades, manually operated.

- B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction Waste Management".
4. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:
1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
 2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.

- B. Product Data: For each type of product indicated, include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.
- C. Shop Drawings: Submit detailed shop drawings showing location and extent of roller shades. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other work, operational clearances, and relationship to adjoining work.
- D. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Ceiling suspension system members and attachment to building structure.
 - 2. Ceiling-mounted or penetrating items including light fixtures, air outlets and inlets, speakers, sprinklers, recessed shades, and special moldings at walls, column penetrations, and other junctures of acoustical ceilings with adjoining construction.
 - 3. Shade mounting assembly and attachment.
 - 4. Size and location of access to shade operator, and adjustable components.
 - 5. Minimum Drawing Scale: 1/4 inch = 1 foot.
- E. Samples for Verification:
 - 1. Complete, full-size operating unit not less than 16 inches wide for each type of roller shade indicated.
 - 2. Shade Material: Not less than 12-inch-square section of fabric, from dye lot used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of material.
- F. Product Certificates: For each type of roller shade, signed by product manufacturer.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of roller shade.
- H. Maintenance Data: For roller shades to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining roller shades and finishes.
 - 2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
 - 3. Operating hardware.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Installer shall have technical qualifications, experience, trained personnel, and facilities to install specified items.
- B. Source Limitations: Obtain roller shades through one source from a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Flame-Resistance Ratings: Passes NFPA 701.
- D. Product Standard: Provide roller shades complying with WCMA A 100.1.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in factory packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same designations indicated on Drawings and in a window treatment schedule.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Commissioner of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Draper Inc.
2. Hunter Douglas, Inc.
3. Levolor; Levolor-Kirsch Window Fashions; a Newell Rubbermaid Company.
4. MechoShade Systems, Inc. (Basis of Design)
5. Approved equal.

B. Basis of Design: Subject to compliance with requirements, provide Mecho/5, as manufactured by MechoShade Systems, Inc., or approved equal.

2.2 ROLLER SHADES

A. Single Roller Shades, General: Single shade system shall consist of single roller, single fabric-type system, each fashioned with one of the shade fabrics described below.

1. Dual Roller Shades, General: Where indicated, provide dual shade system consisting of dual roller system fashioned with both of the shade fabrics described below.

B. Shade Fabrics:

1. Solar Shade: ASTM D 1925; vinyl-coated polyester yarn. Shade fabric shall be free from defects including, but not limited to, runs, tears, and warp and weft not perpendicular to each other. Fabric shall comply with flame retardance requirements of local authorities having jurisdiction.

2. **Black-Out Shade:** Provide the manufacturer's standard series opaque, colored vinyl material, designed for eliminating all visible light gaps when shades are fully closed. Provide in color as selected by the Commissioner.
- C. **Rollers:** 6063-T6 Extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets; with removable spline fitting integral channel in tube for attaching shade material. Provide capacity for two roller shade band(s) per roller, unless otherwise indicated.
 1. **Direction of Roll:** As indicated on the Drawings.
- D. **Mounting Brackets:** 1/8" thick galvanized or zinc-plated steel sheet; wall jamb or ceiling mounted as indicated. Provide center support brackets as required to span or weight loads.
- E. **Audiovisual Light-Blocking Shades:** Designed for eliminating all visible light gaps when shades are fully closed; fabricated from blackout shade band material with fascia and bottom bar extended and formed for light-tight joints among shade components and between shade components and adjacent construction.
 1. **Side and Sill Channels:** Manufacturer's standard design, including sill light seal attached to bottom bar, for eliminating light gaps when shades are closed.
- F. **Bottom Bar:** Steel or extruded aluminum, with capped ends. Provide concealed, by pocket of shade material, internal-type bottom bar with concealed weight bar as required for smooth, properly balanced shade operation.
- G. **Mounting:** Between jambs, or as indicated on the Drawings; permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.
- H. **Shade Operation:** Manual roller shades shall be equipped with continuous loop bead chain, clutch, and cord tensioner and bracket lift operator.
 1. **Position of Operator:** As indicated on the Drawings.
 2. **Clutch:** Capacity to lift size and weight of shade; sized to fit roller or provide adaptor.
 3. **Lift-Assist Mechanism:** Manufacturer's standard spring assist for balancing roller shade weight and lifting heavy roller shades.
 4. **Loop Length:** Length required to make operation convenient from floor level, or as indicated on the Drawings.
 5. **Bead Chain:** Stainless steel.
 6. **Operating Function:** Stop and hold shade at any position in ascending or descending travel.

2.3 ROLLER SHADE FABRICATION

- A. **Product Description:** Roller shade consisting of a roller, a means of supporting the roller, a flexible sheet or band of material carried by the roller, a means of attaching the material to the roller, a bottom bar, and an operating mechanism that lifts and lowers the shade.
- B. **Concealed Components:** Noncorrodible or corrosion-resistant-coated materials.
 1. **Lifting Mechanism:** With permanently lubricated moving parts.

- C. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting fascia, headbox, roller, and operating hardware and for hardware position and shade mounting method indicated.
- D. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.
- E. Color-Coated Finish: For metal components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions, and located so shade band is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean roller shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Commissioner, before time of Substantial Completion.

END OF SECTION 122413

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SECTION 124813 - ENTRANCE FLOOR MATS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide entrance mats in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Roll-up entrance mats in recessed frames.

- B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction Waste Management".
4. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide roll-up mats and frames capable of withstanding the following loads and stresses within limits and under conditions indicated:

1. Rolling wheel load of 1500 lbs. per wheel.

1.4 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:
1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
 2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.

4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review.
- B. Product Data: Submit manufacturer's specifications and installation instructions. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- C. Shop Drawings: Submit detailed drawings showing the following:
1. Items penetrating foot grilles and frames, including door control devices.
 2. Divisions between mat sections.
 3. Perimeter floor moldings.
- D. Samples: Submit samples for verification purposes in form of 12-inch-square assembled section of floor mat. Also submit 12" long piece of frame.
- E. Maintenance Data: For floor mats and frames to include in maintenance manuals.
- 1.5 GREEN BUILDING SUBMITTAL REQUIREMENTS
- A. The GREEN BUILDING submittal information shall be assembled into one (1) package per Section or trade, and sent to the Consultant of review. Incomplete or inaccurate GREEN BUILDING submittals may be used as the basis for rejecting the submitted products or assemblies.
- 1.6 QUALITY ASSURANCE
- A. Source Limitations: Obtain floor mats and frames through one source from a single manufacturer.
- B. Accessibility Requirements: Provide installed foot grilles that comply with "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)" and ICC A117.1
- 1.7 PROJECT CONDITIONS
- A. Field Measurements: Indicate measurements on Shop Drawings.
- 1.8 COORDINATION
- A. Coordinate size and location of recesses in concrete with installation of finish floors to receive floor mats and frames.

PART 2 - PRODUCTS

2.1 ENTRANCE MATS

- A. Basis-of-Design: Subject to compliance with requirements, provide Model M-775 EnvIRONtread, as manufactured by ARDEN Architectural Specialties, Inc., or approved equal from one of the following:
1. Balco, Inc.
 2. C/S Group.
 3. Mats, Inc.
- B. Roll-up, Aluminum-Rail Hinged Mats: Extruded-aluminum tread rails, 1/2 inch thick, sitting on continuous vinyl cushions.
1. Tread Inserts: Fiber reinforced rubber, color Grey.
 2. Rail Finish: Clear anodized.
 3. Hinges: Polyethylene plastic.
- C. Mat Size: As indicated or selected by the Commissioner.
- D. Recessed Frames:
1. Extruded Aluminum: ASTM B 221, Alloy 6061-T6 or Alloy 6063-T5, T6, or T52.
 2. Finish: Clear anodized.

2.2 CONCRETE FILL AND GROUT MATERIALS

- A. Provide concrete grout and fill equivalent in strength to cast-in-place concrete slabs for recessed mats and frames. Use aggregate no larger than one-third fill thickness.

2.3 FABRICATION

- A. Floor Mats: Shop fabricate units to greatest extent possible in sizes indicated. Unless otherwise indicated, provide single unit for each mat installation; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Miter corner joints in framing elements with hairline joints or provide prefabricated corner units without joints.
- B. Recessed Frames: As indicated, for permanent recessed installation, complete with corner pins or reinforcement and anchorage devices.
1. Fabricate edge-frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins.
- C. Coat surfaces of aluminum frames that will contact cementitious material with manufacturer's standard protective coating.

2.4 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and floor conditions for compliance with requirements for location, sizes, minimum recess depth, and other conditions affecting installation of floor mats and frames.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install recessed mat frames to comply with manufacturer's written instructions. Set mat tops at height recommended by manufacturer for most effective cleaning action; coordinate top of mat surfaces with bottom of doors that swing across mats to provide clearance between door and mat.
 - 1. Install necessary shims, spacers, and anchorages for proper location and secure attachment of frames.
 - 2. Install grout and fill around frames and, if required to set mat tops at proper elevations, in recesses under mats. Finish grout and fill smooth and level.

3.3 PROTECTION

- A. After completing frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION 124813

SECTION 142400 - HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes conversion of the existing hydraulic freight elevator to a service elevator.
- B. Related Sections include the following:
 - 1. Division 05 Section "Decorative Metal" for combination units that contain hall push-button stations.
 - 2. Division 09 Sections for finish flooring in elevator cars.
 - 3. Division 09 painting Sections for field painting of hoistway entrance doors and frames.
 - 4. Division 26 Sections for electrical service for the elevator and its controller.
 - 5. Division 27 Section "Communications Horizontal Cabling" for telephone service for the elevator.
 - 6. Division 28 Section "Fire Detection and Alarm" for smoke detectors in elevator lobbies to initiate emergency recall operation and heat detectors in shafts and machine rooms to disconnect power from elevator equipment before sprinkler activation and for connection to elevator controllers.
- C. Includes furnishing and installing the following:
 - 1. Car wall finishes including trim.
 - 2. Car floor finishes.
 - 3. Car ceiling finishes.
 - 4. Car and hoistway door finishes.
 - 5. Car door sills.
 - 6. Car light fixtures.
 - 7. Handrails.
 - 8. Cutouts and other provisions for installing elevator signal equipment in cars.

1.3 DEFINITIONS

- A. Definitions in ASME A17.1 apply to work of this Section.
- B. Defective Elevator Work: Operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
- C. Service Elevator: A passenger elevator that is also used to carry freight.

1.4 SUBMITTALS

- A. Evaluation of the existing equipment: Include written assessment of the existing components and their suitability for reuse.
- B. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for the following:
 - 1. Car enclosures and hoistway entrances.
 - 2. Operation, control, and signal systems.
- C. Shop Drawings: Show plans, elevations, sections, and large-scale details indicating service at each landing, machine room layout, coordination with building structure, relationships with other construction, and locations of equipment and signals. Include large-scale layout of car control station. Indicate variations from specified requirements, maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.
- D. Samples for Verification: For exposed finishes of cars, hoistway doors and frames, and signal equipment; 3-inch-square Samples of sheet materials; and 4-inch lengths of running trim members.
- E. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway, pit, and machine room layout and dimensions, as shown on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided.
- F. Qualification Data: For Installer.
- G. Operation and Maintenance Data: For elevator to include in emergency, operation, and maintenance manuals.
- H. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.
- I. Warranty: Special warranty specified in this Section.
- J. Continuing Maintenance Proposal: Service agreement specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Elevator manufacturer.
- B. Regulatory Requirements: Comply with ASME A17.1.
 - 1. Effective peak velocity acceleration (A_v) for Project's location greater than or equal to 0.10, but less than 0.20 (seismic risk zone 2).
 - 2. Elevator importance factor is 1.0.
- C. Accessibility Requirements: Comply with Section 4.10 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
- D. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to

authorities having jurisdiction, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to UL 10B.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials, components and equipment in manufacturer's protective packaging.
- B. Store materials, components, and equipment off of ground, under cover, and in a dry location. Handle according to manufacturer's written recommendations to prevent damage, deterioration, or soiling.

1.7 COORDINATION

- A. Coordinate installation of the new elevator equipment with the existing pit ladders, sumps, and floor drains in pits; guide rails, ; and electrical service, electrical outlets, lights, and switches in pits and machine rooms.
- B. Coordinate sequence of elevator installation with other work to avoid delaying the Work.

1.8 WARRANTY

- A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to repair, restore, or replace defective elevator work within the warranty period specified in Schedule B of the Addendum to the General Conditions.

1.9 WARRANTY SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, provide one year's full maintenance service by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
 - 1. Perform maintenance, including emergency callback service, during normal working hours.
 - 2. Include 24-hour-per-day, 7-day-per-week emergency callback service.
 - a. Response Time: Two hours or less.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Fujitec America, Inc.

2. KONE Inc.
3. Otis Elevator Co.
4. Schindler Elevator Corp.
5. ThyssenKrupp Elevator.

2.2 SYSTEMS AND COMPONENTS

- A. General: Provide manufacturer's standard elevator systems. Where components are not otherwise indicated, provide standard components published by manufacturer as included in standard pre-engineered elevator systems and as required for complete system.
- B. The existing equipment shall be inspected, tested, readjusted if necessary and reused if possible. The components to be evaluated and considered for reuse include, but are not limited to:
1. Pump unit and oil storage tank
 2. Control valve
 3. Pipe rupture valve
 4. Hydraulic silencers
 5. Hydraulic fluid
 6. Hydraulic oil cooler
 7. Hydraulic oil lines, fittings, connections and related devices and supports
 8. Hydraulic pistons and cylinders
 9. Car frame and platform
 10. Car guides
 11. Guide rails and brackets
 12. Buffers and springs
 13. Over speed governors and safety gears
 14. Hoistway switches

2.3 OPERATION SYSTEMS

- A. General: Provide manufacturer's standard microprocessor operation system for each elevator as required to provide type of operation system indicated. Where components are not otherwise indicated, provide standard components published by manufacturer as included in standard pre-engineered elevator systems and as required for complete system.
- B. Car Operation:
1. Elevator operation shall be controlled from hall landing call buttons and car operating station buttons.
 2. Momentary pressure on one or more operating buttons, other than those at the landing at which the elevator is parked, shall cause the elevator to automatically start and travel to that landing. Elevator shall stop at the first landing for which a car or hall landing call is registered, corresponding to the direction of elevator travel. If a call is placed at a landing where the elevator is parked, elevator shall automatically start, cancel call and open doors.
 3. Elevator shall stop and respond to hall or car calls in the order in which the landings are reached, corresponding to the elevator's direction of travel. In the absence of registered car calls, elevator shall respond to the highest DOWN landing call. After clearing this call, elevator shall proceed to answer the remaining DOWN landing calls and subsequent car calls in the order such calls are reached. Once the lowest DOWN call has been answered, and no car calls exist, elevator shall respond to lowest UP direction call and proceed to respond to these calls in similar fashion. Hall landing calls in opposite direction shall be retained and responded to once elevator reverses direction.

4. Upon arrival at a landing, for which car call or hall landing call is registered, doors shall commence their opening sequence only after the elevator stops level at a landing.
5. Once the elevator stops in answer to hall a landing or car call, doors shall remain open or dwell for minimum period of time. Dwell time interval shall be adjustable for both hall and car calls to a maximum of 20.0 seconds.
6. In absence of hall landing or car call demands, elevator shall park at its main landing with the doors closed.
7. Provide independent key operated service feature to allow elevator to be removed from normal service and respond to car calls only. Once activated, automatic door closing and door dwell times shall be cut out, hall push button riser operation including any registered landing calls shall be cancelled, elevator directional indicators shall extinguish. Once activated, momentary pressure of car call button shall register call demand. Door closure shall be controlled by constant pressure on either car call button or Door Close button. Upon arrival at that landing, elevator doors shall automatically open and remain open until the doors are closed in manner as described above or elevator is returned to normal operation. Activation of Independent Service shall be controlled by 2-position keyswitch mounted in car operating panel's service cabinet and on each landing.
8. Provide low oil protection. Upon detection of low oil condition, in either an UP travelling elevator or a car that is parked at an upper landing, car calls shall be cancelled and the car will stop further upwards travel. The car shall reverse its direction and proceed non-stop to the bottom terminal landing. Upon arrival at that landing, the car doors shall open to permit passengers to exit. After a preset time, car doors shall close. After the elevator has parked at its bottom landing, and sufficient oil has returned to the tank, the low oil switch shall manually reset. This feature shall not be automatically reset. If sufficient oil has returned to the tank, after manual reset, the elevator shall return to normal operation. During instances when the elevator is shut down by this switch, all door operation controls (i.e., DOOR OPEN) and in car alarms shall remain in operation. Upon arrival at landing following activation of this feature, car doors shall automatically open for a normal dwell interval then close. However, DOOR OPEN button shall remain effective, allowing doors to be reopened by either in the car operating panel or at the remote panel in the Station Collector's Booth.
9. Provide low oil protection circuit with a "TEST" button mounted in the controller. Activation of this button shall cause elevator to immediately activate low oil protection circuit in accordance with the foregoing operation.
10. Provide directional reversal which allows elevator, with no car calls registered, to respond to landing call in original direction of elevator travel. Where no further demand for elevator travel in that direction exists, elevator shall be capable of automatically reversing its direction of travel and respond to opposite direction hall landing call. Before reversing direction and responding to the opposite direction call, elevator doors shall have first closed, then hall lantern and in car directional indicator signals for new direction of travel shall illuminate as car doors reopen.
11. Upon arrival at terminal landing, registered car calls shall extinguish. Alternatively, prevent car calls for landings "behind" current elevator location, from being registered.
12. Provide car controller with temperature over heat sensor, with adjustable temperature range limits, designed to automatically cause elevator to shut down at a lobby landing and be removed from normal operation in the event an overheat condition is detected within the car controller. Once activated, car shall be brought to the closest available landing, then shut down and park with its doors closed at that landing. Upon arrival at bottom landing, doors shall automatically open for a normal dwell interval then close. However, DOOR OPEN button shall remain effective, allowing doors to be reopened by the car operating panel. Temperature setting range shall be adjustable between 65 to 150 degrees F, with final temperature setting to be made in the field at time of final commissioning.
13. Provide hydraulic oil tank with hydraulic fluid temperature over heat sensor, with adjustable temperature range limits, designed to automatically cause elevator to shut

down at a lobby landing and be removed from normal operation in the event an over heat oil condition is detected. Once activated, car shall be brought to its bottom landing, then shut down and parked with its doors closed at that landing. Upon arrival at its bottom landing, doors shall automatically open for a normal dwell interval then close. However, DOOR OPEN button shall remain effective, allowing doors to be reopened by the car operating panel. Temperature setting range shall be adjustable between 120 to 212 degrees F.

- C. Auxiliary Operations: In addition to primary operation system features, provide the following operational features in accordance with the scheduled requirements within this specification.
1. Audible Handicap Feature:
 - a. An audible signal shall be provided when the elevator car passes or stops at a floor level. One signal per floor shall be given.
 - b. Activation of the voice announcer announcing the floor levels may be considered to satisfy this feature, if the journey times will allow the floor messages to be relayed without confusion to passengers.
 - c. This feature shall be easily disabled from within the controller without the need to disconnect any wiring.
 2. Automatic Re-leveling:
 - a. Provision shall be made to allow for automatic, accurate re-leveling of the elevator car where, after stopping at a floor, loading, unloading or in the event of hydraulic elevator's sinkage, causes the car to move out of floor level by more than $\frac{1}{4}$ in with the doors open or closed.
 3. Building Fire Detection System Recall:
 - a. Following receipt of a signal from the building fire detection system, the elevator shall cancel all car and landing calls and return non-stop to the main floor (if no fire fighting floor is specified).
 - b. The elevator shall return to normal operation automatically from the parked condition, when the alarm signal is removed.
 4. Call Registered Indicator:
 - a. Each push button shall incorporate an illuminating indication that it has been operated, which shall be cancelled when the function has been completed. (i.e. door open illuminates until the doors are fully open, a car or landing call button illuminates until the call is answered etc.) This feature is to be provided in conjunction with dual illumination as detailed below.
 5. Car Arrival Gongs:
 - a. A sounder shall be provided at each floor to give an audible indication when the elevator car arrives at the landing in response to a hall call.
 - b. The sounder shall operate once for the up direction and twice for the down direction and shall incorporate an adjustable setting to enable operation between 2 and 5 seconds before the elevator arrives at a floor.
 - c. The gongs shall be easily disabled from within the controller without the need to disconnect wires.
 6. Landing Lanterns:
 - a. When the elevator car arrives or is standing at a landing and it has a further call registered, an arrow shall illuminate to indicate the next starting direction. The arrow illumination color will be red for down-direction and green for up-direction. The lanterns shall start to flash at an adjustable time before the elevator stops at floor, before illuminating continuously.
 7. Car Arrival Indicator:
 - a. Indicators shall be provided at each landing, which shall illuminate an adjustable period before arrival, between 2 and 5 seconds.

8. Door Close Button:
 - a. A push button shall be provided such that when the doors are fully open and it is pressed the doors will close.
 - b. The door close push shall only operate when the elevator doors are fully open and shall not over ride an open door signal provided by the controller which would cause the doors to reverse mid way through an opening sequence.
9. Door Open Button:
 - a. A push button shall be provided which shall remain effective when the elevator is standing within a door zone. By pushing the button the doors will re-open if they are closing or closed and remain open for a pre-set period.
 - b. No control or security features shall be arranged to override the operation of the door open push, which might lead to a possibility of trapping passengers within the elevator car.
10. Earthquake Operation:
 - a. Upon operation of a seismic detector, elevator shall stop at the nearest possible floor in the direction of travel.
 - b. Elevator shall remain stopped with doors open, until a thorough inspection of the elevator has been carried out and all seismic detector units have been reset.
 - c. Local or regional regulations may also apply.
11. Operation Under Standby Power:
 - a. When the stand-by power becomes available after failure of the normal power elevator shall be recalled to the return floor when the drive signal is given.
 - b. The doors shall be parked in the closed position in accordance with local requirements.
12. Emergency Recall Operation:
 - a. When the stand-by power becomes available after failure of the normal power elevator shall be recalled to the return floor when the drive signal is given.
 - b. The doors shall be parked in either the open or closed position in accordance with local requirements.
13. Fire fighting Control:
 - a. Elevator will be equipped with Phase I and Phase II emergency operation.
 - b. Phase II Emergency In-Car Operation: the operation of an elevator by fire fighters where the elevator is under their control.
 - c. Phase I Emergency Recall Operation: the operation of an elevator where it is automatically or manually recalled to the recall level and removed from normal service because of activation of fire fighters' emergency operation.
 - d. The Contractor shall provide all associated wiring and containment between the changeover switch equipment and the indicator panel at the Fire Service Access Level.
 - e. A continuous audible signal in the car shall sound and a visual signal shall be displayed in the car stating "ELEVATOR UNDER FIRE FIGHTING CONTROL".
14. Motor Start Counter:
 - a. A mechanical, analogue, motor starts counter shall be provided which shall be easily readable by persons with authority to access the machinery space without needing to open the control panel.
15. Overload Control:
 - a. If the carload exceeds the elevator capacity by more than 10%, (or a minimum of 75kg) the car shall be prevented from starting and the doors shall remain open. A visual signal shall illuminate in the car-operating panel and in addition a buzzer shall sound or alternatively the voice announcer, if fitted, shall announce the overload condition.
16. Water Sensor in Pit:
 - a. A sensor shall be provided in the elevator pit, which detects the presence of water. When the sensor is activated, a signal will be provided via volt free contacts, which will enable operation of an alarm and / or a pumping device as necessary. After

activation of the sensor, the elevator car will not serve the top and bottom floors and if the car is standing at the bottom or the top floor, it will move away from that floor.

17. Corridor Call Station Pictograph Signs: Provide signs matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire elevator is out of service and exits should be used instead. Provide one sign at each hall push-button station, unless otherwise indicated.

D. Controllers

1. Construction

- a. The control system shall be of the microprocessor type.
- b. The components and cabinets shall be designed and mounted in a manner that facilitates inspection, maintenance, adjustment and replacement of any serviceable parts.
- c. All ground connections shall be made at a common link within the control panel.
- d. Components within the control panel shall be permanently labeled and any codes or abbreviations shall match the wiring diagrams and clearly detailed in the Designation Schedule.
- e. Terminals shall be of the screw-clamp type, or equal alternative. A minimum of 10% spare terminals shall be provided for control wiring in addition to any spare terminals provided for the spare travelling cable cores.
- f. All spare terminals shall be clearly identified.
- g. A volt free contact shall be provided for each elevator to provide a common fault signal for the building management system (BMS)

2. Interference

- a. The arrangement of the electrical equipment shall be such that there is no interference with the correct operation of radio, television receivers or other electronic apparatus in this or other buildings in the locality, caused by the normal working of the elevator installation.
- b. No suppression components shall be used in any part of the circuit where their failure might cause an unsafe condition.

2.4 DOOR REOPENING DEVICES

- A. Infrared Array: Provide door reopening devices with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more of the light beams shall cause doors to stop and reopen.
- B. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door reopening device, a loud buzzer shall sound and doors shall begin to close at reduced kinetic energy.

2.5 FINISH MATERIALS

- A. General: Provide the following materials for exposed parts of elevator car enclosures, car doors, hoistway entrance doors and frames, and signal equipment as indicated.
- B. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.
 1. Textured Stainless-Steel Sheet: Product with embossed texture rolled into exposed surface.
- C. Stainless-Steel Bars: ASTM A 276, Type 304.

- D. Stainless-Steel Tubing: ASTM A 554, Grade MT 304.
- E. Aluminum Extrusions: ASTM B 221, Alloy 6063.

2.6 CAR ENCLOSURE

- A. General: Provide steel-framed car enclosure with non-removable wall panels, with car roof, access doors, power door operators, and ventilation.
 - 1. Provide standard railings complying with ASME A17.1 on car tops where required by ASME A17.1.
 - 2. Provide finished car including materials and finishes specified below.
 - 3. Provide items as needed for finished car including materials and finishes specified below.
- B. Materials and Finishes: Provide manufacturer's standards, but not less than the following:
 - 1. Subfloor: Underlayment grade, exterior plywood, 5/8-inch nominal thickness.
 - 2. Floor Finish: Specified in a Division 09 Section.
 - 3. Stainless-Steel Wall Panels: Flush, hollow-metal construction; fabricated from stainless-steel sheet.
 - 4. Fabricate car with recesses and cutouts for signal equipment.
 - 5. Fabricate car door frame integrally with front wall of car.
 - 6. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet.
 - 7. Sight Guards: Provide sight guards on car doors.
 - 8. Sills: Extruded metal, with grooved surface, 1/4 inch thick.
 - 9. Luminous Ceiling: Fluorescent light fixtures and ceiling panels of translucent acrylic or other permanent rigid plastic.
 - 10. Metal Ceiling: Flush panels, with lighting arranged as indicated.
 - 11. Handrails: Manufacturer's standard handrails, of shape, metal, and finish indicated.

2.7 HOISTWAY ENTRANCES

- A. General: Provide manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Provide frame size and profile to coordinate with hoistway wall construction.
- B. Materials and Fabrication: Provide manufacturer's standards, but not less than the following:
 - 1. Stainless-Steel Frames: Formed from stainless-steel sheet.
 - 2. Stainless-Steel Doors and Transoms: Flush, hollow-metal construction; fabricated from stainless-steel sheet.
 - 3. Sight Guards: Provide sight guards on doors matching door edges.
 - 4. Sills: Extruded metal, with grooved surface, 1/4 inch thick.
 - 5. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.

2.8 SIGNAL EQUIPMENT

- A. General: Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Fabricate lighted elements with LEDs.

- B. Car Control Stations: Provide manufacturer's standard recessed car control stations. Mount in return panel adjacent to car door, unless otherwise indicated.
- C. Swing-Return Car Control Stations: Provide car control stations mounted on rear of hinged return panel adjacent to car door and with buttons, switches, controls, and indicator lights projecting through return panel but substantially flush with face of return panel.
1. Mark buttons and switches with standard identification for required use or function that complies with ASME A17.1. Use both tactile symbols and Braille.
 2. Provide "No Smoking" sign matching car control station, either integral with car control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.
- D. Emergency Communication System: Provide system that complies with ASME A17.1 and the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." On activation, system dials preprogrammed number of monitoring station and identifies elevator location to monitoring station. System provides two-way voice communication without using a handset and provides visible signals that indicate when system has been activated and when monitoring station has responded. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.
- E. Firefighters' Two-Way Telephone Communication Service: Provide flush-mounted cabinet in each car and required conductors in traveling cable for firefighters' two-way telephone communication service specified in Division 28 Section "Fire Detection and Alarm."
- F. Car Position Indicator: Provide illuminated, digital-type car position indicator, located above car door or above car control station. Also provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served.
1. Include travel direction arrows if not provided in car control station.
- G. Hall Push-Button Stations: Provide one hall push-button station at each landing.
1. Provide units with flat faceplate for mounting with body of unit recessed in wall.
 2. Equip units with buttons for calling elevator and for indicating desired direction of travel.
 3. Provide telephone jack in each unit for firefighters' two-way telephone communication service specified in Division 28 Section "Fire Detection and Alarm."
- H. Hall Lanterns: Units with illuminated arrows; but provide single arrow at terminal landings. Provide the following:
1. Units with flat faceplate for mounting with body of unit recessed in wall and with illuminated elements projecting from faceplate for ease of angular viewing.
- I. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.
- J. Hall Position Indicators: Provide illuminated, digital-display-type position indicators, located above hoistway entrance at ground floor. Provide units with flat faceplate for mounting and with body of unit recessed in wall.
- K. Fire Command Center Annunciator Panel: Provide panel containing illuminated position indicators for elevator, clearly labeled with elevator designation; include illuminated signal that indicates when elevator is operational and when it is at the designated emergency return level with doors open. Provide standby power elevator selector switch, as required by ASME A17.1,

adjacent to position indicators. Provide illuminated signal that indicates when normal power supply has failed.

- L. Corridor Call Station Pictograph Signs: Provide signs matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire elevator is out of service and exits should be used instead. Provide one sign at each hall push-button station, unless otherwise indicated.

2.9 ELEVATOR

A. Elevator Description:

1. Service Elevator Number(s): ELEV-01.
2. Rated Load: 8000 lb.
3. Freight Loading Class for Service Elevators: Class A.
4. Rated Speed: 125.
5. Operation System: Single automatic operation.
6. Auxiliary Operations:
 - a. Battery-powered lowering.
 - b. Loaded-car bypass.
7. Dual Car Control Stations: Provide two car control stations; equip only one with required keyswitches, if any.
8. Car Enclosure:
 - a. Inside Width: 134 inches from side wall to side wall.
 - b. Inside Depth: 78.5 inches from back wall to front wall (return panels).
 - c. Inside Height: 120 inches to underside of ceiling.
 - d. Front Walls (Return Panels): Satin stainless steel, No. 4 finish with integral car door frames.
 - e. Car Fixtures: Satin stainless steel, No. 4 finish.
 - f. Side and Rear Wall Panels: Satin stainless steel, No. 4 finish.
 - g. Reveals: Satin stainless steel, No. 4 finish.
 - h. Door Faces (Interior): Satin stainless steel, No. 4 finish.
 - i. Door Sills: Aluminum, mill finish.
 - j. Ceiling: Satin stainless steel, No. 4 finish.
 - k. Handrails: 1-1/2 inches round satin stainless steel, No. 4 finish, at sides and rear of car.
 - l. Floor: Rubber flooring.
 - m. Floor Thickness, Including Setting Materials: 5/8 inches above plywood subfloor.
9. Hoistway Entrances:
 - a. Width: 96 inches.
 - b. Height: 120 inches.
 - c. Type: Two-speed center opening.
 - d. Fire-Protection Rating: 1-1/2 hours.
 - e. Frames: Satin stainless steel, No. 4 finish.
 - f. Doors and Transoms: Satin stainless steel, No. 4 finish.
 - g. Sills: Aluminum, mill finish.
10. Hall Fixtures Satin stainless steel, No. 4 finish.
11. Additional Requirements:
 - a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, No. 4 finish.

- b. Provide blanket hooks and one complete set of full-height protective blankets.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Verify critical dimensions and examine supporting structure and other conditions under which elevator work is to be installed.
 1. For the record, prepare a written report, endorsed by Installer, listing dimensional discrepancies and conditions detrimental to performance or indicating that dimensions and conditions were found to be satisfactory.
 2. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Examine system components which are to be reused with Installer present, to ensure they are fully functional and can be safely reused.
 1. For the record, prepare a written report, endorsed by Installer, listing the state and condition of all components listed as existing to remain in this specification.
 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 DEMOLITION

- A. Disassemble and remove the existing elevator car enclosure, car and landing doors, controller and any hydraulic equipment deemed not suitable for re-use.

3.3 DELIVERY OF EQUIPMENT TO SITE

- A. Provide all hoisting, lifting, transportation, street permits, police and traffic control as required during the off loading of elevator equipment at the Site.
- B. Coordinate with the Contractor, regarding the method and timing of all equipment deliveries and storage locations.

3.4 INSTALLATION

- A. Install any hydraulic equipment requiring replacement.
- B. Install new elevator car enclosure, landing doors and controller as per contract drawings and specifications.
- C. Once platform is moveable, provide guide rail alignment tool and undertake check of car guide rail alignment. Advise the Client Representative of time when alignment is to be measured, and undertake check in presence of the Client Representative. Once platform is moveable, provide guide rail alignment tools (rail bugs, plumb lines, DBG gauges) and undertake check of car guide rail alignment to demonstrate rail installation alignment is in accordance with Contract requirements. Clearly demonstrate that guide rail columns have been installed plumb and parallel. Advise of time when alignment is to be measured and undertake alignment checks in the presence of the Client Representative.

- D. Set twin jack units to be aligned and plumb within 1/16 in of each other. Ensure that both pistons are aligned and installed such that when the elevator is sitting at its top landing, neither piston will bend enough to distort the packing seals and permit loss of oil through the cylinder head.
- E. Set entrance frames in proper alignment with car platform. Fasten frames to available wall and floor supports. Advise the Client Representative when check of entrance frame alignment is to be made. Set up and mark out hoistway and platform to show alignment requirements. The Client Representative shall witness alignment measurement checks.
- F. Install entrances so frames are plumb within maximum variation of 1/8 in, measured between entrance landing sill and header, top to bottom. Install and align door panels so gap between adjacent panels and between slow speed panel and stationary slide frame post does not exceed 3/8 in. Ensure vertical clearance between underside of car and landing door panels and top surface of landing/car sill does not exceed 3/8 in.
- G. Provide all required alignment lines, and setting gauges to assess and confirm entrance alignment limits. Set up and demonstrate actual alignments of cab platform to landing entrance frames to the Client Representative.
- H. Install hoistway fascia panels in vertical alignment with entrances. Provide additional supports and fasteners to ensure entire length of pit toe guard and fascia panels are secured so they are completely flush with outer edge of hall landing sills.
- I. Prior to the installation of the hoistway fascia, landing sill alignment and shimming shall be made available for inspection. This check shall verify compliance with sill installation alignment and shim stock type and material.
- J. Hall landing sills shall be installed so they are flush with the finished floor elevation of the floor adjacent to the landing sill, entrance side.
- K. At the time of the installation of the elevator car enclosure, make available the cab for review of the cab subfloor and the connection between the side walls and the floor to ensure proper sealing and connection to the sub floor. This check must be done prior to the installation of the cab finished flooring.
- L. Provide stiffeners and additional brackets to prevent fascia panels and hanger covers from warping or deflecting.
- M. Exposed Work within car enclosure and hall landing entrances shall be fabricated in true planes. Metal and wood sections shall be installed flat, be securely fastened and aligned so as to be straight and true. They shall be free of visible imperfections. Joints shall be accurately fitted, aligned and installed in same plane.
- N. Provide access to pit and hoistway as required by other trades working within hoistway and pit areas. Coordinate with all trades and Site forces required to work in hoistway, pit, operation of the elevator cab platform, as required to complete this Work.
- O. Finish coat painting of hoistway construction will be carried out by Division 9.
- P. Install stainless steel handrails for a rigid and secure installation.
- Q. Install floor finish as specified in Divisions 9.

- R. Cut pit fascia and toe guard as required to accommodate pit drains. Where cylinder head support beams run perpendicular to drain location, effectively cutting off drainage route, provide drain channels and slope floor to ensure any build up of fluids in the pit will readily run off towards the pit drain location.
- S. Locate all equipment data tags so they are readily viewable. Clear all construction debris and dirt, and clean any paint stains off all tags.
- T. Coordinate location of elevator controller and power units to suit locations of mechanical equipment and services as shown on Drawings. The locations of mechanical equipment and services are fixed as per the Drawings, rearrange and position elevator equipment to accommodate the necessary working spaces, service access and safety clearances as required by Code, within the spaces available.
- U. Hoistway equipment shall be installed so as not to impinge upon car running clearances, regardless of position of car doors.
- V. All corners, edges and surfaces of stainless steel panels, fixture faceplates, frames, door panels and railings shall be honed to a radiused, non cutting surface.
- W. Provide galvanized metal back boxes for all hall and car fixtures.
- X. Leveling Tolerance: 1/4 inch up or down, regardless of load and direction of travel.
- Y. Set sills flush with finished floor surface at landing. Fill space under sill solidly with non-shrink, nonmetallic grout.
- Z. Calibrate and adjust the newly installed and existing equipment to ensure safe operation of the entire system.
- AA. Lubricate operating parts of systems as recommended by manufacturers.
- BB. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay installation of sills and frames until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.
- CC. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.
- DD. Locate hall signal equipment for elevator as follows, unless otherwise indicated:
 - 1. Mount hall lanterns at a minimum of 72 inches above finished floor.

3.5 WIRING

- A. Install wiring in neat fashion.
- B. Tie-wrap conductors.
- C. Protect wiring running from motor terminal junction box mounted on tank unit to drive motor connection box affixed to drive motor. Wiring between these two boxes shall be run within flexible metal conduit, properly secured and hung to alleviate strain on conductors and terminals. Do not leave wiring unsupported or unsecured, nor shall plastic tie wraps be used for the means of support.

- D. Spare conductors shall be wrapped together and labeled with their ends insulated.
- E. Wiring connections shall be soldered or fastened to terminal strips or studs using approved mechanical fasteners.
- F. Provide wiring harness where multiple conductors are terminated at remote panel terminal strips.
- G. Controller components shall be clearly marked with designations corresponding to those used on electrical circuit drawings.
- H. Provide insulated bushings around wiring openings where travelling cable and other multi conductor cables are run through openings in car enclosure. Where traveling cables are hanging against supports, provide grommet or other insulation fitting to ensure edge of hanger does not cut into cable jacket.
- I. Wiring connections to door detectors shall be protected from chaffing and splitting and routed so they are removed from public access.
- J. Where armored flexible conduit is used, provide conduit supports and fastenings at intervals of not more than 3 feet. Flex conduit shall be secured in place to prevent inadvertent or unauthorized movement especially around areas accessible from entrance opening.
- K. No conduit, flex, electrical tubing or fittings shall be installed at an elevation that is less than 3 feet above the pit floor slab. Bottom final limit switch, conduit and wiring to these switches may be installed below this elevation, where required. However, under no circumstances shall any wiring or conduit be installed along the pit floor slab.
- L. Use proper anti shorts in all conduit connections. Use metal fasteners to secure sections of conduit and flex tubing to supports. Do not use tie wraps or other plastic fastening means.
- M. Install and secure in place all raceway covers. Do not leave any conductor runs exposed.

3.6 TOUCH UP AND CLEANING

- A. Comply with requirements as set out in DDC General Conditions.

3.7 EQUIPMENT PERFORMANCE AND ADJUSTMENT SETTINGS

- A. Adjust elevator to attain the following performance criteria:
- B. Rated car speed in the UP direction, under full car load, shall be no less than rated speed. Under other load conditions, rated speed shall not vary by more than +10%.
- C. Rated car speed in the DOWN direction, under full car load, shall be no less than rated car speed. Under other load conditions, rated speed shall not vary by more than -7%.
- D. No noticeable shift in acceleration or deceleration rates.
- E. Maximum acceleration rate to be 3.5 fps².
- F. Maximum jerk rate of 7.0 fps³.

- G. Door open time shall be set at 2.0 seconds.
- H. Door close time shall be set at 3.0 seconds.
- I. Dwell time for car and hall landing calls shall be initially set at 4.0 seconds.
- J. Door detector interrupt and nudging time shall be initially set at 10.0 seconds.
- K. Door recycle time shall be set between 6.0 seconds.
- L. Car leveling accuracy shall be maintained at +/- 1/4 in, under all load conditions.
- M. Car exercise/recycle circuit shall be set to operate after 20 minutes of car inactivity.
- N. Ground level landing return or parking timer shall initially be set between 4 and 5 minutes.
- O. The total maximum sound pressure levels (L_{max}, slow time response) arising from operation of the elevator installation, including direct sound transmission, breakout noise and re-radiation of structure-borne noise shall be no greater than the following limits:
 - 1. 40 dB(A) on all elevator landings, 3-ft from the elevator
 - 2. 50 dB(A) 3-ft in front of elevator doors as a result of their opening and closing
 - 3. 55 dB(A) in elevator car
 - 4. 65 dB(A) in elevator shaft

3.8 PAINTING OF ELEVATOR EQUIPMENT

- A. All exposed metalwork, installed under these Specifications shall be painted.
- B. Provide minimum of 2 coats of rust inhibiting black enamel on structural components, including supports, guide rail brackets, and guide rails (except for running surfaces).
- C. Paint top of shaft hoisting provisions that remain in place in flat black enamel.
- D. Paint exterior non glazed or polished metal sides of cab enclosure, car top, platform, plank, crosshead, and all other visible supports and devices in 2 coats of black enamel paint.
- E. Paint exposed edges of platform and non polished metal portions of the car.
- F. Prime coat painted surfaces shall be finished in manufacturer's standard enamel finish.
- G. Paint with 2 coats of flat black colored rust resistant enamel, all pit equipment, including cylinders, cylinder stands, buffers, buffer stands, pit channels, pit access ladder (where not galvanized), rail brackets, switch cover boxes, toe guard, electrical conduit and troughing, to fro line, muffler and to fro line stands.
- H. Paint with 2 coats of colored rust resistant enamel, all exposed hoistway equipment, including metal fascia, hanger covers, sill supports, entrance frame struts and supports, switch boxes, terminal limit and landing switch supports. Color of paint shall be flat black. Do not paint or otherwise obscure clear plastic fascia panel sections. Protect sections of plastic fascia during hoistway painting.
- I. Provide machine room controller cabinet, oil pipe line, oil line support stands and oil tank with 2 finishing coats of paint, prior to equipment turnover. Color of paint shall be flat black.

- J. Where machine room controller equipment has been provided in factory applied enamel, touch up damaged or marred surfaces with the same color enamel prior to Substantial Performance.
- K. Do not paint over equipment data tags or nameplates.
- L. Apply car number designation to controller and tank unit after finish coat painting. Use stencils. Do not use hand markings.

3.9 DEMONSTRATION OF OPERATING AND CONTROL FEATURES

- A. Immediately following Substantial Performance, provide for a period of one half day, a technically competent person to demonstrate elevator operating and control features.
- B. Demonstration shall take place at location as determined and as scheduled by the Client Representative.
- C. Demonstrations shall include the testing and demonstration of the following equipment features:
 - 1. Elevator Firefighter's Operation (Phase 1) under manual activation.
 - 2. Elevator Fire Operation (Phase 2), in car operation.
 - 3. Elevator operation under battery power lowering.
 - 4. Elevator independent service operation.
 - 5. Control of elevator cab lights.
 - 6. Control of elevator cab fan.
 - 7. Operation of SCADA monitoring signals.
 - 8. Operation of in car public address speaker.
 - 9. Operation of door detector device.
 - 10. Operation of intercom.
 - 11. Explanation of elevator landing and car signal controls and features.
 - 12. Explanation of basic elevator system components.
 - 13. Explanation of elevator performances such as door open and close times, leveling accuracy and nudging.

3.10 FIELD QUALITY CONTROL

- A. Acceptance Testing: On completion of elevator installation and before permitting use (either temporary or permanent) of elevator, perform acceptance tests as required and recommended by ASME A17.1 and by governing regulations and agencies.
- B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times tests are to be performed on elevator.

3.11 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate, adjust, and maintain elevator.
- B. Check operation of elevator with Owner's personnel present and before date of Substantial Completion. Determine that operation systems and devices are functioning properly.
- C. Check operation of elevator with Owner's personnel present not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

END OF SECTION 142400

SECTION 144200 - WHEELCHAIR LIFTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included: Provide wheelchair lifts in accordance with the Contract Documents. The "General Conditions Governing All Contracts" shall apply to all work under the Contract. The Work of this Section shall include, but not be limited to, the following:

1. Vertical platform wheelchair lifts.

B. Related Sections:

1. Division 1 Section "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings" (LEED Building).
2. Division 1 Section "Sustainable Design Requirements (LEED Building)".
3. Division 1 Section "Construction Waste Management".
4. Division 1 Section "Construction IAQ Requirements".

1.2 LEED BUILDING, GENERAL REQUIREMENTS

- A. The City of New York requires the Contractor to implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ Green Building rating. Specific project goals which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

1.3 SUBMITTALS

- A. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:
1. Material cost breakdowns, submitted in the format of the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, per Division 1 "Sustainable Design Requirements" of these specifications.
 2. Additional information to complete the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 3. Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided in the ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM, as requested by the Commissioner.
 4. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).
 5. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Commissioner for review

- B. **Product Data:** For each type of product indicated, include rated capacities, operating characteristics, dimensions, electrical characteristics, safety features, controls, and finishes.
 - C. **Shop Drawings:** Submit detailed shop drawings for each lift. Include plans, elevations, sections, details, and attachments to other work.
 - 1. **Detail equipment assemblies** and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. **Wiring Diagrams:** For power, signal, and control wiring.
 - D. **Samples for Initial Selection:** For surfaces and components with factory-applied color finishes.
 - 1. Include similar Samples of accessories involving color selection.
 - E. **Samples for Verification:** For each type of exposed finish required, prepared on Samples of size indicated below:
 - 1. **Metal Finish:** Manufacturer's standard-size unit, not less than 3 inches square.
 - 2. **Tubular Products and Running Trim:** Manufacturer's standard-size unit, 6 inches long.
 - 3. **Glass and Glazing:** Units 12 inches square.
 - 4. **Hardware:** Manufacturer's standard, exposed, door-operating device.
 - F. **Qualification Data:** Submit written information that demonstrates capabilities and experience of qualified installer.
 - G. **Manufacturer Certificates:** Signed by lift manufacturer certifying that runway, ramp or pit, and dimensions as shown on Drawings and that electrical service as shown and specified are adequate for lift being provided.
 - H. **Inspection and Acceptance Certificates and Operating Permits:** As required by authorities having jurisdiction for normal, unrestricted use of lifts.
 - I. **Operation and Maintenance Data:** For each type of lift to include in operation and maintenance manuals. Include the following:
 - 1. **Parts list** with sources indicated.
 - 2. **Recommended parts inventory list.**
 - J. **Warranties:** Submit copies of special warranties specified in this Section.
 - K. **Continuing maintenance proposal.**
- 1.4 **QUALITY ASSURANCE**
- A. **Installer Qualifications:** Engage an installer authorized by the manufacturer for the installation of units required for this Project.
 - B. **Regulatory Requirements:** In addition to requirements of authorities having jurisdiction, comply with ASME A18.1, "Safety Standard for Platform Lifts and Stairway Chairlifts."
 - C. **Fire-Rated, Runway-Enclosure Door Assemblies:** Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 or UL 10B.

1. Temperature-Rise Limit: Provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of lifts that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

1.6 WARRANTY SERVICE

- A. Warranty Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of lift installer. Include quarterly preventive maintenance and repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper lift operation at rated speed and capacity. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36.
- B. Steel Tubing: ASTM A 500.
- C. Steel Pipe: ASTM A 53; standard weight (Schedule 40) unless otherwise indicated or required by structural loads.
- D. Cold-Rolled Steel Sheet: ASTM A 1008, commercial steel (CS), Type B, exposed, matte finish.
- E. Hot-Rolled Steel Sheet: ASTM A 1011, commercial steel (CS), Type B, pickled.
- F. Galvanized-Steel Sheet: ASTM A 653, G90 zinc coating,
 1. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
 - a. ASTM A 123, for galvanizing steel and iron products.
 - b. ASTM A 153, for galvanizing steel and iron hardware.
- G. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing structural members, guide rails, machines, and other lift components where installation of devices is specified in another Section.
- H. Expansion Anchors: Anchor-bolt-and-sleeve assembly of material indicated below with capability to sustain a load equal to 10 times the load imposed as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

- I. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.

2.2 VERTICAL PLATFORM LIFTS

- A. Vertical Platform Lifts: Manufacturer's standard preengineered lift systems as indicated.
 1. Basis-of-Design: Subject to compliance with requirements, provide PL-S 120 wheelchair lift, as manufactured by ThyssenKrupp, or comparable product by one of the following:
 - a. Concord Elevator Inc.
 - b. Garaventa Accessibility.
 - c. Savaria Corporation.
 - d. Approved equal.
- B. Platform Size: 36 inches x 48 inches, unless otherwise indicated.
- C. Door Operation and Clear Opening Width: Low-energy, power-operated doors that remain open for 20 seconds minimum; with 35 5/8 inches clear opening width.
- D. Rated Speed: 9 fpm, minimum.
- E. Rated Capacity: 750 lbs.
- F. Power Supply: 115 V, 60 Hz, 20 amps, 1 phase.
- G. Emergency Operation: Provide emergency manual operation to raise or lower units in case of malfunction or power loss.
- H. Self-Supporting Units: Support vertical loads of units only at base, with lateral support only at landing levels.
- I. Base Frame: Fabricated from structural steel tubing and angles.
- J. Runway Enclosure: Manufacturer's standard enclosure assembly, consisting of rectangular galvanized or hot-dip-galvanized steel tube frame with flush steel or hot-dip-galvanized sheet panels.
- K. Fire-rated Enclosure Doors: Galvanized or hot-dip-galvanized flush steel entrance doors, with VDR mechanical interlock and acrylic glass vision panel.
 1. Fire-Protection Rating: 1-1/2 hours.
- L. Top Landing Gate: Galvanized or hot-dip-galvanized flush steel entrance doors, with VDR mechanical interlock and flush steel panel.
- M. Platform: Steel plate or sheet with black rubber strips.
- N. Side Wall Panels: Provide galvanized or galvanized steel panels set in steel tube frame.
- O. Front Access Panel: Provide galvanized or galvanized steel panels.
- P. Fixed Ramp: Provide fixed ramp matching platform to provide transition from floor to lift platform at bottom landing.

- Q. Guide Rail: Painted steel tube; ASTM A 500, grade B.
- R. Accessories: Provide units with the following accessories:
 - 1. Fold-down seat with armrests and safety belt.
 - 2. Lighting system within lift enclosures as indicated on Drawings or selected by Commissioner from manufacturer's available products.

2.3 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.4 FINISHES

- A. Steel and Galvanized-Steel Factory Finish:
 - 1. Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard, thermosetting polyester or acrylic urethane powder coating with a cured film thickness not less than 1.5 mils.
 - 2. Color and Gloss: As selected by the Commissioner from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, critical dimensions, and other conditions affecting performance.
- B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Wiring Method: Conceal conductors and cables within housings of units or building construction. Do not install conduit exposed to view in finished spaces. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
- B. Coordinate runway doors with platform travel and positioning, for accurate alignment and minimum clearance between platforms, runway doors, sills, and door frames.
- C. Position sills accurately and fill space under sills solidly with nonshrink, nonmetallic grout.

- D. Coordinate platform doors with platform travel and positioning.
- E. Adjust stops for accurate stopping and leveling at each landing, within required tolerances.
 - 1. Leveling Tolerance: 1/4 inch up or down, regardless of load and direction of travel.
- F. Lubricate operating parts of lift, including drive mechanism, guide rails, hinges, safety devices, and hardware.
- G. Test safety devices and verify smoothness of required protective enclosures and fascias

3.3 FIELD QUALITY CONTROL

- A. Acceptance Testing: On completion of lift installation and before permitting use of lifts, perform acceptance tests as required and recommended by ASME A18.1 and authorities having jurisdiction.
- B. Operating Test: In addition to above testing, load lifts to rated capacity and operate continuously for 30 minutes between lowest and highest landings served. Readjust stops, signal equipment, and other devices for accurate stopping and operation of system.
- C. Advise City of New York, Commissioner, and authorities having jurisdiction in advance of dates and times tests are to be performed on lifts.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train City of New York's maintenance personnel to adjust, operate, and maintain lifts. Include a review of emergency systems and emergency procedures to be followed at time of operational failure and other building emergencies.
- B. Check operation of lifts with City of New York's personnel present and before date of Substantial Completion. Determine that operating systems and devices are functioning properly.
- C. Check operation of lifts with City of New York's personnel present not more than one month before end of warranty period. Determine that operating systems and devices are functioning properly.

END OF SECTION 144200

**CONTRACT # 2
PLUMBING WORK**

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SECTION 220013 – PLUMBING CONTRACTOR WORK

ALLOWANCE FOR INCIDENTAL ASBESTOS ABATEMENT

1.01 SCOPE FOR ASBESTOS ABATEMENT WORK

- A. The "General Conditions" apply to the work of this Section.
- B. The Asbestos abatement contractor shall remove asbestos containing materials as needed to perform the other work of this Contract when discovered during the course of work. When required, the Asbestos abatement contractor shall replace the ACM with non-asbestos containing materials. An allowance of **\$5,000.00** for the **Plumbing Contractor** is herein established for this incidental work when so ordered and authorized by the Commissioner.
- C. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE APPLICABLE PROVISIONS OF THE RULES AND REGULATIONS OF THE ASBESTOS CONTROL PROGRAM AS PROMULGATED BY TITLE 15 CHAPTER I OF RCNY AND NEW YORK STATE DEPARTMENT OF LABOR INDUSTRIAL CODE RULE 56 CITED AS 12 NYCRR, PART 56 WHICHEVER IS MORE STRINGENT AS PER LATEST AMENDMENTS TO THESE LAWS AND AS MODIFIED HEREIN BY THESE SPECIFICATIONS.
- D. ALL DISPOSAL OF ASBESTOS CONTAMINATED MATERIAL SHALL BE PER LOCAL LAW 70/85.
- E. THE ASBESTOS ABATEMENT CONTRACTOR'S ATTENTION IS DIRECTED TO THE FACT THAT CERTAIN METHODS OF ASBESTOS ABATEMENT ARE PROTECTED BY PATENTS. TO DATE, PATENTS HAVE BEEN ISSUED WITH RESPECT TO "NEGATIVE PRESSURE ENCLOSURE" OR "NEGATIVE-AIR" OR "REDUCED PRESSURE" AND "GLOVE BAG".
- F. THE ASBESTOS ABATEMENT CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR AND SHALL HOLD THE DEPARTMENT OF DESIGN AND CONSTRUCTION AND THE CITY HARMLESS FROM ANY AND ALL DAMAGES, LOSSES AND EXPENSES RESULTING FROM ANY INFRINGEMENT BY THE ASBESTOS ABATEMENT CONTRACTOR OF ANY PATENT, INCLUDING BUT NOT LIMITED TO THE PATENTS DESCRIBED ABOVE, USED BY THE ASBESTOS ABATEMENT CONTRACTOR DURING PERFORMANCE OF THIS AGREEMENT.
- G. "Asbestos" shall mean any hydrated mineral silicate separable into commercially usable fibers, including but not limited to chrysotile (serpentine), amosite (cumingtonite-grunerite), crocidolite (riebeckite), tremolite, anthrophyllite and actinolite.

- H. Prior to starting, the Asbestos abatement contractor must notify the Commissioner of the Department of Design and Construction if he/she anticipates any difficulty in performing the Work as required by these Specifications. The Asbestos abatement contractor is responsible to prepare and submit all filings, notifications, etc. required by all City, State and Federal regulatory agencies having jurisdiction.

The Asbestos abatement contractor is responsible for submitting the Asbestos Project Notification Form (ACP-7 Form) to the Department of Environmental Protection, Asbestos Control Program, as per Title 15, Chapter I of RCNY and to the NYSDOL as per Industrial Code Rule 56.

The Asbestos abatement contractor is responsible for preparing, and submitting Asbestos Variance Application (ACP-9). If a Variance is required, the Asbestos abatement contractor is responsible to retain a NYSDOL Asbestos Project Designer, as defined in Title 15, Chapter 1 of the RCNY to prepare and submit the required variance.

The Asbestos abatement contractor is responsible for preparing and submitting an Asbestos Abatement Permit and/or Work Place Safety Plans (WSP) that may be required for the completion of the Contract or incidental work. If such plans are required, the Asbestos abatement contractor is responsible to retain a NYSDOL Licensed Design Professional as defined in Title 15, Chapter 1 of the RCNY to prepare and submit the required plans.

The Asbestos abatement contractor is responsible for the submission of all required documents to the NYCDEP to acquire the appropriate Asbestos Project Conditional Closeout (ACP-20) and/or Asbestos Project Completion Forms (ACP-21) on a timely basis for the completion of the incidental work encountered under this contract.

The Asbestos abatement contractor will be required to attend an on-site job meeting with the Construction Project Manager prior to the start of work to examine conditions and plan the sequence of operations, etc.

The Asbestos abatement contractor shall have a NYSDOL/NYCDEP Asbestos Supervisor onsite to oversee the work and conduct a final visual inspection as required by both Title 15, Chapter 1 of the RCNY and NYSDOL Industrial Code Rule 56.

- I. All work shall be done during regular working hours unless the Asbestos abatement contractor requests authorization to work in other than regular working hours and such authorization is granted by the Commissioner. (Regular work hours are those hours during which any given facility, in which work is to be done, is customarily open and functioning, normally between the hours of 8:00 A.M. and 4:00 P.M. Monday - Friday.) If such work schedule is authorized by the Commissioner, the work shall be done at no additional cost to the City.

- J. The Commissioner may order that work be done in other than regular working hours as herein by defined and this order may require the Asbestos abatement contractor to pay premium or overtime wages to complete the work. If the Commissioner orders work in other than regular working hours, the Asbestos abatement contractor shall multiply the unit price for that portion of the work requiring premium wages by 1.50 when computing payment in accordance with Paragraph 1.09. All requests for premium payment must be supported by certified payroll sheets and field sheets approved by the Construction Project Manager.

1.02 QUALIFICATIONS OF ASBESTOS ABATEMENT CONTRACTOR

- A. Requirements: The asbestos abatement contractor must demonstrate compliance with the special experience requirements set forth in subparagraphs (1) through (5) below. The asbestos abatement contractor must, submit documentation demonstrating compliance with all listed requirements. Such documentation shall include without limitation, all required licenses, certificates, and documentation.
1. The asbestos abatement contractor must, whether an individual, corporation, partnership, joint venture or other legal entity, must demonstrate for the three year period prior to the work, that it has been licensed by the New York State Department of Labor, as an "Asbestos abatement contractor".
 2. The asbestos abatement contractor must, for the three year period prior to the work, have been in the business of providing asbestos abatement services as a routine part of its daily operations.
 3. The asbestos abatement contractor proposing to do asbestos abatement work must be thoroughly experienced in such work and must provide evidence of having successfully performed and completed in a timely fashion at least five (5) asbestos abatement projects of similar size and complexity. The aggregate cost of these projects must be at least \$250,000.00 in each of the three years.
 4. For each project submitted to meet the experience requirements set forth above, the asbestos abatement contractor must submit the following information for the project; name and location of the project; name title and telephone number of the owner or the owner's representative who is familiar with the asbestos abatement contractor's work, brief description of the work completed as a prime or sub-asbestos abatement contractor; amount of contract or subcontract and the date of completion.
 5. The asbestos abatement contractor must demonstrate that it has the financial resources, supervisory personnel and equipment necessary to carry out the work and to comply with the required performance schedule, taking into consideration other business commitments. The asbestos

abatement contractor must submit such documentation as may be required by the Department of Design and Construction to demonstrate that it has the requisite capacity to perform the required services of this contract.

- B. Insurance Requirements: The asbestos abatement contractor must provide asbestos liability insurance in the following amount: 1 million dollars per occurrence, 2 million dollars aggregate (combined single limit). The City of New York shall be named as an additional insured on such insurance policy.
- C. Throughout the specifications, reference is made to codes and standards which establish qualities and types of workmanship and materials, and which establish methods for testing and reporting on the pertinent characteristics thereof.

1.03 ASBESTOS ABATEMENT CONTRACTOR RESPONSIBILITIES

The Asbestos abatement contractor will visit the subject location within one (1) working day of notification to ascertain actual work required. If the project is identified as being "urgent", then work shall commence no later than 48 hours from the time of notification. In this event, the asbestos abatement contractor shall immediately notify when applicable EPA NESHAPS Coordinator, NYSDOL Asbestos Control Bureau and NYCDEP Asbestos Control Program of start of the work and file the necessary Asbestos Notifications and any applicable Variance Applications with the regulatory agencies cited above..

In the event that the project is not classified as "urgent" the Asbestos abatement contractor shall notify the EPA NESHAPS Coordinator, NYSDOL and NYCDEP by submitting the requisite asbestos project notification forms, postmarked 10 days before activity begins if 260 linear feet or more and/or 160 square feet or more of asbestos containing material will be disturbed.

The following information must be included in the notification:

- A. Name and address of building City or operator;
- B. Project description:
 - 1. Size - square feet, number of linear feet, etc;
 - 2. Age - date of construction and renovations (if known);
 - 3. Use - i.e., office, school, industrial, etc.
 - 4. Scope - repair, demolition, cleaning, etc.
- C. Amount of asbestos involved in work and an explanation of techniques used to determine the amount;

- D. Building location/address, including Block and Lot numbers;
- E. Work schedule including the starting and completion dates;
- F. Abatement methods to be employed;
- G. Procedures for removal of asbestos-containing material;
- H. Name, title and authority of governmental representative sponsoring project.

1.04 WORK INCLUDED IN UNIT PRICE

The Asbestos abatement contractor will be paid a basic unit price of **\$25.00** per square feet for the removal and disposal of asbestos containing material and replacement of the same with non-asbestos containing materials.

Unit price shall include all costs necessary to do the work of this Contract, including but not limited to: labor, materials, equipment, utilities, disposal, insurance, overhead and profit.

1.05 AIR MONITORING – ASBESTOS ABATEMENT CONTRACTOR

- A. "Air Sampling" shall mean the process of measuring the fiber content of a known volume of air collected during a specific period of time. The procedure utilized for asbestos follows the NIOSH Standard Analytical Method 7400 or the provisional transmission electron microscopy methods developed by the USEPA and/or National Institute of Standard and Technology which are utilized for lower detectability and specific fiber identification.
- B. Air monitoring of Asbestos abatement contractor's personnel will be performed in conformance with OSHA requirements, (All costs associated with this work are deemed included in the unit price.).
- C. Qualifications of Testing Laboratory:

The industrial hygiene laboratory shall be a current proficient participant in the American Industrial Hygiene Association (AIHA) PAT Program. The laboratory identification number shall be submitted and approved by the City. The laboratory shall be accredited by the AIHA and New York State Department of Health Environmental Laboratory Approval Program (ELAP).

Note: Work area air testing and analysis before, during and upon completion of work (clearance testing) will be performed by a Third Party Air Monitor under separate Contract with the City.

1.06 THIRD PARTY MONITORING AND LABORATORY

- A. The NYCDDC, at its own expense, will employ the services of an independent Third Party Air Monitoring Firm and Laboratory. The Third Party Air Monitor will perform air sampling activities and project monitoring at the Work Site.
- B. The Laboratory will perform analysis of air samples utilizing Phase Contrast Microscopy (PCM) and/or Transmission Electron Microscopy (TEM).
- C. The Third Party Air Monitoring Firm and the designated Project Monitor shall have access to all areas of the asbestos removal project at all times and shall continuously inspect and monitor the performance of the Asbestos abatement contractor to verify that said performance complies with this Specification. The Third-Party Air Monitor shall be on site throughout the entire abatement operation.
- D. The NYCDDC will be responsible for costs incurred with the Third Party Air Monitoring Firm and laboratory work. Any subsequent additional testing required due to limits exceeded during initial testing shall be paid for by the Asbestos abatement contractor.

1.07 PAYMENT REQUEST DOCUMENTATION

- B. The following information shall be included for each payment request:
 - 1. Description of work performed.
 - 2. Linear footage and pipe sizes involved.
 - 3. Square footage for boiler & breaching insulation removed.
 - 4. Square footage of non pipe and boiler areas removed, patched, enclosed, sealed, or painted.
 - 5. Square footage of encapsulation, sealing, patching, and painting involved.
 - 6. Total cost associated with compliance with the assigned task.
 - 7. Architectural, Electrical, HVAC, Plumbing, etc. work incidental to the Asbestos Abatement Work.
 - 8. A certified copy (in form 4312-39) to the Comptroller or Financial Officer of the New York City to the effect that the financial statement is true.
 - 9. A signed copy (in form 6506q-6) of certificate of compliance with non-discriminatory provisions of the Contract.

- 10. Attach a copy of valid workmen compensation insurance.
 - 11. Valid asbestos insurance per occurrence.
 - 12. General liability insurance when required.
- C. Each payment request shall include a grand total for all work completed that billing period, the landfill waste manifests and a copy of waste transporter permit. The Department of Design and Construction will inspect the work performed, review the cost and approve or disapprove requests for payment.
- D. EXPOSURE LOG: With this final payment, the Asbestos abatement contractor shall submit a listing of the names and social security numbers of all employees actively engaged in the abatement work of this Contract. This list shall include a summary showing each part of the abatement work in which the employee was engaged and the dates thereof.

1.08 QUANTITY CALCULATIONS

In order to determine the square footage involved for the various pipe sizes of pipe insulation that might be encountered, the following table is to be used.

<u>PIPE INSULATION SIZE O.D.</u>	<u>PIPE SIZE O.D.</u>	<u>SQUARE FOOTAGE PER LINEAR FOOT</u>
2-1/2"	1/2"	0.65
2-3/4"	3/4"	0.72
3"	1"	0.79
3-1/4"	1-1/4"	0.85
3-1/2"	1-1/2"	0.92
4"	2"	1.05
4-1/2"	2-1/2"	1.18
5"	3"	1.31
6"	3-1/4"	1.57
7"	3-1/2"	1.83
8"	4"	2.09
9"	5"	2.36
10"	6"	2.62
12"	8"	3.14
14"	10"	3.67
16"	12"	4.19
18"	14"	4.71

1.09 METHOD OF PAYMENT

Payment shall be made in accordance with Items A through R below. Payment shall be calculated based on the actual quantity of the item performed by the asbestos abatement

contractor, times the unit price specified below. Credits may apply to certain times, as specified below.

- A. **REMOVAL, DISPOSAL AND REPLACEMENT OF ASBESTOS CONTAINING PIPE INSULATION:** Actual linear footage, multiplied by the square footage factor listed for the respective pipe size in Section 1.09, multiplied by the unit price in Section 1.05.

EXAMPLE: 100 lin.ft. of 1/2" pipe and 100 lin.ft. of 6" pipe, including elbows, tees. Flanges, etc.

$$100 \times 0.65 = 65 \text{ sq.ft.} \quad 65 \times \text{unit price} = \text{Payment}$$

$$100 \times 2.62 = 262 \text{ sq.ft.} \quad 262 \times \text{unit price} = \text{Payment}$$

- B. **REMOVAL, DISPOSAL AND REPLACEMENT OF BOILER INSULATION:** (all types including Silicate Block and including the removal/replacement of metal jacketing) Payment shall be made at 1.5 times the unit price per square foot.

EXAMPLE: Item B. removal and replacement of 1000 S.F. of boiler insulation (incl. Silicate block)

$$1000 \text{ S.F.} \times (1.5) \times \text{the Unit Price} = \text{Payment}$$

- C. **REMOVAL, DISPOSAL AND REPLACEMENT OF TANK INSULATION:** (all types including removal/replacement of metal jacketing) Payment shall be made at 1.5 times the unit price per square foot.
- D. **REMOVAL, DISPOSAL AND REPLACEMENT OF BOILER UPTAKE, & BREACHING INSULATION:** (all types including stiffening angles and wire lath) Payment shall be made at 2.0 times the unit price per square foot.
- E. **REMOVAL, DISPOSAL AND REPLACEMENT OF DUCT INSULATION:** Payment shall be made at 1.0 times the unit price per square foot.
- F. **REMOVAL, DISPOSAL AND REPLACEMENT OF SOFT ASBESTOS CONTAINING MATERIAL:** (Including sprayed-on fire proofing and sound proofing) Payment shall be made at 1.0 times the unit price per square foot of surface area. Area of irregular surfaces must be calculated and confirmed with DDC representative.
- G. **ACOUSTIC PLASTER REPAIR AND/OR ENCAPSULATION:** Payment shall be made at 0.5 times the unit price per square foot.
- H. **PATCHING OR REPAIR** of items listed in A through F will be paid at 0.33 times the unit price per square foot.

- I. **REMOVAL, DISPOSAL AND REPLACEMENT OF WATERPROOFING ASBESTOS CONTAINING MATERIAL:** (including friable and non-friable waterproofing material from interior and exterior walls, floors, foundations, penetrations, louvers, vents and openings other than windows, doors and skylights) Payment shall be made at 0.5 times the unit price per square foot.
- J. **REMOVAL, DISPOSAL AND REPLACEMENT OF ASBESTOS CONTAINING ELECTRICAL WIRING INSULATION:** (including friable and non-friable wiring insulation) Payment shall be made at 0.33 times the unit price per square foot.
- K. **PAINTING:** Payment shall be made at 0.05 times the unit price per square foot.
- L. **REMOVAL AND DISPOSAL OF ASBESTOS-CONTAINING PLASTER:** from ceilings and walls, including any wire lath and disposal as asbestos containing waste. Payment shall be made at 0.80 times the unit price per square foot.
- M. **REMOVAL AND DISPOSAL OF ASBESTOS-CONTAINING FLOOR TILES, CEILING TILES, TRANSITE PANELS:** (including any adhesive, glue, mastic and/or underlayment) and disposal as asbestos containing waste. Payment shall be made at 0.40 times the unit price per square foot. If multiple layers are discovered, each additional layer shall be paid at 0.20 times the unit price per square foot.
- N. **ADDITIONAL CLEAN UP/HOUSEKEEPING OF WORK AREA:** (excluding pre-cleaning of work area required by regulations) HEPA vacuuming and wet cleaning of asbestos contaminated surface. Payment shall be made at 0.20 times the unit price per square foot. When GLOVE BAG is employed to remove ACM, cost of HEPA vacuuming and wet cleaning of floor area up to 3 feet on each side of glove-bag shall be included in unit price and no extra payment will be made.
- O. **REMOVAL, DISPOSAL OF ASBESTOS-CONTAINING ROOFING MATERIAL:** including mastic, flashing and sealant compound and provide temporary asbestos-free roof covering consisting of one layer of rolled roofing paper sealed with asphaltic roofing compound. Payment shall be made at 0.8 times the unit price per square foot. Credit at a rate of 0.33 times the unit price will be taken for each square foot of temporary roof covering which the Asbestos abatement contractor is directed not to install.
- P. **PICK-UP AND DISPOSAL OF GROSS DEBRIS:** (excluding any waste generated from abatement under Item A-R) at a rate of \$150 per cubic yard for asbestos contaminated waste and \$75 per cubic yard for non-asbestos contaminated waste. This cost includes all labor and material cost associated with work.

- Q. **REMOVAL OF ASBESTOS-CONTAINING BRICK, BLOCK, MORTAR, CEMENT OR CONCRETE:** along with all surfacing materials including wire lath and/or other supporting structures and disposal as ACM waste. Payment shall be made at a rate of \$25.00 per cubic foot of material removed.
- R. **REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING WINDOW/DOOR CAULKING:** including friable and non-friable caulking, weather-stripping, glazing, sealants or other waterproofing materials applied to windows, doors, skylights, etc. Payment shall be made at the rate of \$400.00 per opening regardless of size or configuration. This cost includes labor, consumable materials, set-up/breakdown, removal and disposal, as required.

Note 1: CREDIT: For items listed in A through F, a credit at a rate of 0.33 times the unit price, times the respective multiplier (for each item) will be taken for each square foot of insulation which the asbestos abatement contractor is not directed to reapply.

Note 2: MINIMUM PAYMENT: The minimum payment per call at any individual job sites or various job sites during the same day will be eight hundred dollars (\$800.00).

Note 3: All payments shall be made as described in paragraph 1.09 herein.

Note 4: WORKING HIGHER THAN 12 FEET ABOVE FLOOR LEVEL OR WORK REQUIRING COMPLEX SCAFFOLDING OR CONSTRUCTION WORK PLATFORMS: Provisions are made in this Contract to compensate the Asbestos abatement contractor for work performed in locations that are difficult to access due to work at elevations that are significantly higher than the normal work level. The unit price for these items will be paid at 1.20 times the unit price described in Paragraphs 1.09, A through R for those portions of the work that are more than twelve (12) feet above the grade for that would be judged as the normal working level.

1.10 GUARANTEE

- A. Work performed in compliance with each task shall be guaranteed for a period of one year from the date the completed work is accepted by the Department of Design and Construction.
- B. The Commissioner of The Department of Design and Construction will notify the Asbestos abatement contractor in writing regarding defects in work under the guarantee.

1.11 OCCUPANCY OF SITE NOT EXCLUSIVE

Attention is specifically drawn to the fact that contractors, performing the work of other Contracts, may be brought upon any of the work sites of this Contract. Therefore, the Asbestos abatement contractor shall not have exclusive rights to any site of his work and shall fully cooperate and coordinate his work with the work of other contractors who may

be brought upon any site of the work of this Contract. This paragraph applies to those areas outside the regulated Work Area as defined by Title 15, Chapter I of RCNY.

1.12 SUBMITTALS

A. Pre-Construction Submittals:

1. Attend a pre-construction meeting scheduled by the City of New York Department of Design and Construction. This meeting shall also be attended by a designated representative of the City of New York third party air monitoring firm, facility manager and the Construction Project Manager. At this meeting, the Asbestos abatement contractor shall present three copies of the following items:
 - a. Asbestos abatement contractor's scope of work, work plan and schedule.
 - b. Asbestos project notifications, approved variances and plans to Government Agencies.
 - c. Copies of Permits, clearance and licenses if required.
 - d. Schedules: the Asbestos abatement contractor shall provide to the Construction Project Manager a copy of the following schedules for approval. Once approved, schedules shall be maintained and updated as received. Asbestos abatement contractor shall post a copy of all schedules at the site:
 - (1) A construction schedule stating critical dates of the project including, but not limited to, mobilization, Work Area preparation, demolition, gross removal, fine cleaning, encapsulation, inspections, clearance monitoring, and phase of refinishing and final inspections. The schedule shall be updated biweekly, at a minimum.
 - (2) A schedule of staffing stating number of workers per shift per activity, name and number of supervisor(s) per shift, shifts per day, and total days to be worked.
 - (3) Submit all changes in schedule or staffing to the Construction Project Manager prior to implementation.
 - e. Written description of emergency procedures to be followed in case of injury or fire. This section must include evacuation procedures, source of medical assistance (name and telephone number to nearest

hospital) and procedures to be used for access by medical personnel (examples: first aid squad and physician). NOTE: Necessary Emergency Procedures Shall Take Priority Over All Other Requirements of These Specifications.

- f. Material Safety Data Sheets (MSDS) for encapsulants, sealants, firestopping foam, cleaners/disinfectants, spray adhesive and any and all potentially hazardous materials that may be employed on the project. No work involving the aforementioned will be allowed to proceed until MSDS are reviewed.
- g. Worker Training and Medical Surveillance: The Asbestos abatement contractor shall submit a list of the persons who will be employed by him /her to perform the removal work. Present evidence that workers have received proper training required by the regulations and the medical examinations required by OSHA 29 CFR 1926.1101.
- h. Logs: Specimen copies of daily progress log, visitor's log, and disposal log.
 - (1) The Asbestos abatement contractor shall provide a permanently bound log book of minimum 8-1/2" x 11" size at the entrance to the Worker and Waste Decontamination enclosure system as hereinafter specified. Log book shall contain on title page the project name, name, address and phone number of the Asbestos abatement contractor; name, address and phone number of Asbestos abatement contractor and City's third party air monitoring firm; emergency numbers including, but not limited to local Fire/Rescue Department. Log book shall contain a list of personnel approved for entry into the Work Area.
 - (2) All entries into the log shall be made in non-washable, permanent ink and such pen shall be strung to or otherwise attached to the log to prevent removal from the log-in area. Under no circumstances shall pencil entries be permitted. Any significant events occurring during the abatement project shall be entered into the log. Upon completion of the job, the Asbestos abatement contractor shall submit the logbook containing a day-to-day record of personnel log entries countersigned by the Construction Project Manager every day.
- i. Worker's Acknowledgments: Submit statements signed by each employee that the employee has received training in the proper handling of ACM, understands the health implications and risks

involved; and understands the use and limitations of the respiratory equipment to be used.

B. During Construction Submittals:

1. Security and safety logs showing names of person entering workspace, date and time of entry and exit, record of any accident, emergency evacuation, and any other safety and/or health incident.
2. Progress logs showing the number of workers, supervisors, hours of work and tasks completed shall be submitted daily to the Construction Project Manager.
3. Floor plans indicating Asbestos abatement contractor's current work progress shall be submitted for review by the Construction Project Manager.
4. All Asbestos abatement contractors' air monitoring and inspection results.

C. Project Closeout Submittals:

Upon completion of the project and as a condition of acceptance, the Asbestos abatement contractor shall present two copies of the following items, bound and indexed:

1. Lien Waivers from Asbestos abatement contractor, Sub-Asbestos abatement contractors and Suppliers,
2. Daily OSHA air monitoring results,
3. All Waste Manifests (Asbestos and Construction Debris), seals and disposal logs,
4. Field Sign-In/Sign-Out Logs for every shift,
5. Copies of all Building Department Forms and Permits,
6. A Letter of Compliance stating that all the work on this project was performed in accordance with the Specifications and all applicable Federal, State and Local regulations,
7. All Warranties as stated in the Specifications,
 - a. Fully executed disposal certificates and transportation manifest.
8. Project Record: The Asbestos abatement contractor shall maintain a project record for all small and large asbestos projects. During the project, the

project record shall be kept on site at all times. Upon completion of the project, the project record shall be maintained by the building owner. The project record shall be submitted to DDC as part of the close out documents. The project record shall consist of:

- a. Copies of licenses of all asbestos abatement contractors involved in the project;
- b. Copies of NYCDEP and NYSDOL supervisor and handler certificates for all workers engaged in the project;
- c. Copies of all project notifications and reports filed with NYCDEP, NYSDOL and USEPA for the project, with any amendments or variances;
- d. Copies of all asbestos abatement permits, including associated approved plans and work place safety plan;
- e. A copy of the air sampling log and all air sampling results;
- f. A copy of the abatement asbestos abatement contractor's daily log book;
- g. Copies of all asbestos waste manifests;
- h. A copy of all Project Monitor's Reports (ACP-15).
- i. A copy of each ATR-1 Form completed for the asbestos project (if required).
- j. A copy of each Asbestos Project Conditional Closeout Report (ACP-20) if required.
- k. A copy of the Asbestos Project Completion Form (ACP-21).

1.13 PROTECTION OF FURNITURE AND EQUIPMENT

Cover all furniture and equipment that cannot be removed from Work Areas. Movable furniture and equipment will be removed from Work Areas by the Asbestos abatement contractor prior to start of work. At the conclusion of the work (after final air testing), the Asbestos abatement contractor will remove all plastic covering on walls, floors, furniture, equipment and reinstall furniture and equipment. He shall remove and store all sheaths, curtains and drapes, and reinstall same following final clean up.

1.14 UTILITIES

A. General:

All temporary facilities shall be subject to the approval of the Commissioner. Prior to starting work at any site, locations and/or sketches (if required) of temporary facilities must be submitted to the Construction Project Manager for the required approval.

B. Water:

The Department of Design and Construction will furnish all water needed for construction, at no cost to the Asbestos abatement contractor in buildings under their jurisdiction. However, it is the responsibility of the Asbestos abatement contractor to ensure that hot water is provided for showering in the decontamination unit. The Asbestos abatement contractor shall furnish, install and maintain any needed equipment to meet these requirements at his own expense.

C. Electricity:

The Department of Design and Construction will furnish all electricity needed for construction, at no cost to the Asbestos abatement contractor in a building, under their jurisdiction. The Asbestos abatement contractor is responsible for routing the electric power to the abatement Work Area.

All temporary lighting and temporary electrical service for Work Area shall be in weatherproof enclosures and be ground fault protected.

D. In leased spaces, arrangements for water supplies and electricity must be made with the landlord. However, all such arrangements must be made through and are subject to approval of the Department of Design and Construction. Utilities will be provided at no cost to the Asbestos abatement contractor. However, it is the Asbestos abatement contractor's (or the Plumbing contractor's) responsibility to furnish and install a suitable distribution system to the Work Area. This system will be provided at no cost to the City.

1.15 FEES

The Asbestos abatement contractor shall be responsible for any and all fees or charges imposed by Local, State or Federal Law, Rule and Regulation applicable to the work specified herein, including fees or charges which may be imposed subsequent to the date of the Bid opening.

END OF SECTION

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SECTION 22 05 00 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Dielectric fittings.
 - 3. Sleeves.
 - 4. Escutcheons.
 - 5. Plumbing demolition.
 - 6. Equipment installation requirements common to equipment sections.
 - 7. Supports and anchorages.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Dielectric fittings.
 - 2. Escutcheons.

1.4 QUALITY ASSURANCE

- A. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

1.6 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.
- B. Coordinate installation of required supporting devices.
- C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

- A. Refer to individual Division 22 piping Sections for special joining materials not listed below.
- B. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

2.4 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
 - 1. Manufacturers:
 - a. Capitol Manufacturing Co.
 - b. Central Plastics Company.
 - c. Eclipse, Inc.
 - d. Epco Sales, Inc.
 - e. Hart Industries, International, Inc.
 - f. Watts Industries, Inc.; Water Products Div.
 - g. Zurn Industries, Inc.; Wilkins Div.
- D. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
 - 1. Manufacturers:
 - a. Calpico, Inc.
 - b. Lochinvar Corp.

- E. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.
1. Manufacturers:
 - a. Perfection Corp.
 - b. Precision Plumbing Products, Inc.
 - c. Sioux Chief Manufacturing Co., Inc.
 - d. Victaulic Co. of America.

2.5 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
1. Underdeck Clamp: Clamping ring with set screws.

2.6 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Cast-Brass Type: With set screw.
1. Finish: Polished chrome-plated and rough brass.

PART 3 - EXECUTION

3.1 PLUMBING DEMOLITION

- A. Refer to **DDC General Conditions** and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove plumbing systems, equipment, and components indicated to be removed.
1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
 3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
 - 1. New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece cast-brass type with polished chrome-plated finish.
 - f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with rough-brass finish.
 - g. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
 - h. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

2. Existing Piping: Use the following:
 - a. Chrome-Plated Piping: Split-casting, cast-brass type with chrome-plated finish.
 - b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge and spring clips.
 - c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
 - d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
 - e. Bare Piping in Unfinished Service Spaces: Split-casting, cast-brass type with rough-brass finish.
 - f. Bare Piping in Equipment Rooms: Split-casting, cast-brass type.
 - g. Bare Piping at Floor Penetrations in Equipment Rooms: Split-casting, floor-plate type.

- M. Sleeves are not required for core-drilled holes.

- N. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor slabs.
 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
 3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
 - b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
 - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
 - 1) Seal space outside of sleeve fittings with grout.
 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

- O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

- P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.
- Q. Verify final equipment locations for roughing-in.
- R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- S. All plumbing fixtures and piping adjacent to the light box and dark box theaters should be vibration isolated from the structure per the requirements outlined in Section 220548 'Vibration and Seismic Controls for Plumbing Piping and Equipment'

3.3 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

3.4 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping 2" and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install equipment to allow right of way for piping installed at required slope.

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.

END OF SECTION 22 05 00

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SECTION 220519 - METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bimetallic-actuated thermometers.
2. Filled-system thermometers.
3. Liquid-in-glass thermometers.
4. Light-activated thermometers.
5. Dial-type pressure gages.
6. Gage attachments.
7. Test plugs.
8. Test-plug kits.
9. Sight flow indicators.

B. Related Sections:

1. Division 21 Fire-suppression piping Sections for fire-protection pressure gages.
2. Division 22 Section "Domestic Water Piping" for water meters inside the building.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Certificates: For each type of meter and gage, from manufacturer.
- C. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Ashcroft Inc.
 2. Ernst Flow Industries.
 3. Tel-Tru Manufacturing Company.
 4. Trerice, H. O. Co.

5. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
 6. Weiss Instruments, Inc.
 7. WIKA Instrument Corporation - USA.
- B. Standard: ASME B40.200.
- C. Case: Liquid-filled and sealed type(s); stainless steel with 3-inch nominal diameter.
- D. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F and deg C.
- E. Connector Type(s): Union joint, adjustable angle, with unified-inch screw threads.
- F. Connector Size: 1/2 inch, with ASME B1.1 screw threads.
- G. Stem: 0.25 or 0.375 inch in diameter; stainless steel.
- H. Window: Plain glass.
- I. Ring: Stainless steel.
- J. Element: Bimetal coil.
- K. Pointer: Dark-colored metal.
- L. Accuracy: Plus or minus 1.5 percent of scale range.

2.2 FILLED-SYSTEM THERMOMETERS

- A. Direct-Mounted, Metal-Case, Vapor-Actuated Thermometers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following;
 - a. Ashcroft Inc.
 - b. Palmer Wahl Instrumentation Group.
 - c. Terice, H. O. Co.
 - d. Weiss Instruments, Inc.
 2. Standard: ASME B40.200.
 3. Case: Sealed type, cast aluminum; 4-1/2-inch nominal diameter.
 4. Element: Bourdon tube or other type of pressure element.
 5. Movement: Mechanical, dampening type, with link to pressure element and connection to pointer.
 6. Dial: Non-reflective aluminum with permanently etched scale markings graduated in deg F and deg C.
 7. Pointer: Dark-colored metal.
 8. Window: Glass.
 9. Ring: Metal
 10. Connector Type(s): Union joint, adjustable, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device; with ASME B1.1 screw threads.
 11. Thermal System: Liquid-filled bulb in copper-plated steel, aluminum, or brass stem and of length to suit installation.

- a. Design for Thermowell Installation: Bare stem.
 12. Accuracy: Plus or minus 1 percent of scale range.
- B. Direct-Mounted, Plastic-Case, Vapor-Actuated Thermometers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ashcroft Inc.
 - b. Miljoco Corporation.
 - c. REOTEMP Instrument Corporation.
 2. Standard: ASME B40.200.
 3. Case: Sealed type, 4-1/2-inch, 5-inch, or 6-inch nominal diameter.
 4. Element: Bourdon tube or other type of pressure element.
 5. Movement: Mechanical, with link to pressure element and connection to pointer.
 6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
 7. Pointer: Dark-colored metal.
 8. Window: Glass or plastic.
 9. Ring: Metal or plastic.
 10. Connector Type(s): Union joint, adjustable, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device; with ASME B1.1 screw threads.
 11. Thermal System: Liquid-filled bulb in copper-plated steel, aluminum, or brass stem and of length to suit installation.
 - a. Design for Thermowell Installation: Bare stem.
 12. Accuracy: Plus or minus 1 percent of scale range.
- C. Remote-Mounted, Metal-Case, Vapor-Actuated Thermometers:
1. Manufacturers: Subject to compliance with requirements, or comparable product by one of the following:
 - a. AMETEK, Inc.; U.S. Gauge.
 - b. Ashcroft Inc.
 - c. Marsh Bellofram.
 - d. Miljoco Corporation.
 - e. Palmer Wahl Instrumentation Group.
 - f. REOTEMP Instrument Corporation.
 - g. Terice, H. O. Co.
 - h. Weiss Instruments, Inc.
 - i. WIKA Instrument Corporation - USA.
 2. Standard: ASME B40.200.
 3. Case: Sealed type, cast aluminum or drawn steel 4-1/2-inch or 6-inch nominal diameter with flange and holes for panel mounting.
 4. Element: Bourdon tube or other type of pressure element.
 5. Movement: Mechanical, with link to pressure element and connection to pointer.
 6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
 7. Pointer: Dark-colored metal.
 8. Window: Glass or plastic.

9. Ring: Metal or Stainless steel.
 10. Connector Type(s): Union joint,; with ASME B1.1 screw threads.
 11. Thermal System: Liquid-filled bulb in copper-plated steel, aluminum, or brass stem and of length to suit installation.
 - a. Design for Thermowell Installation: Bare stem.
 12. Accuracy: Plus or minus 1 percent of scale range.
- D. Remote-Mounted, Plastic-Case, Vapor-Actuated Thermometers:
1. Manufacturers: Subject to compliance with requirements, or comparable product by one of the following:
 - a. AMETEK, Inc.; U.S. Gauge.
 - b. Ashcroft Inc.
 - c. Miljoco Corporation.
 - d. REOTEMP Instrument Corporation.
 - e. Terrice, H. O. Co.
 2. Standard: ASME B40.200.
 3. Case: Sealed type, 4-1/2-inch or 6-inch (152-mm) nominal diameter with flange and holes for panel mounting.
 4. Element: Bourdon tube or other type of pressure element.
 5. Movement: Mechanical, with link to pressure element and connection to pointer.
 6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in deg F and deg C.
 7. Pointer: Dark-colored metal.
 8. Window: Glass or plastic.
 9. Ring: Metal or plastic.
 10. Connector Type(s): Union joint, threaded; with ASME B1.1 screw threads.
 11. Thermal System: Liquid-filled bulb in copper-plated steel, aluminum, or brass stem and of length to suit installation.
 - a. Design for Thermowell Installation: Bare stem.
 12. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.3 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Compact-Style, Liquid-in-Glass Thermometers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Terrice, H. O. Co.
2. Standard: ASME B40.200.
3. Case: Cast aluminum 6-inch nominal size.
4. Case Form: Back angle unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue or red organic liquid.
6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F and deg C.

7. Window: Glass or plastic.
8. Stem: Aluminum or brass and of length to suit installation.
 - a. Design for Thermowell Installation: Bare stem.
9. Connector: 3/4 inch with ASME B1.1 screw threads.
10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

B. Plastic-Case, Compact-Style, Liquid-in-Glass Thermometers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Flo Fab Inc.
 - b. Tel-Tru Manufacturing Company.
 - c. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
 - d. Weiss Instruments, Inc.
2. Standard: ASME B40.200.
3. Case: Plastic; 6-inch nominal size.
4. Case Form: Back angle unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue[or red] organic liquid.
6. Tube Background: Nonreflective with permanently etched scale markings graduated in deg F and deg C.
7. Window: Glass or plastic.
8. Stem: Aluminum or brass and of length to suit installation.
 - a. Design for Thermowell Installation: Bare stem.
9. Connector: 3/4 inch, with ASME B1.1 screw threads.
10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

C. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Flo Fab Inc.
 - b. Palmer Wahl Instrumentation Group.
 - c. Trerice, H. O. Co.
 - d. Weiss Instruments, Inc.
2. Standard: ASME B40.200.
3. Case: Cast aluminum; 9-inch nominal size unless otherwise indicated.
4. Case Form: Adjustable angle unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue[or red] organic liquid.
6. Tube Background: Non-reflective aluminum with permanently etched scale markings graduated in deg F and deg C.
7. Window: Glass
8. Stem: Aluminum and of length to suit installation.
 - a. Design for Thermowell Installation: Bare stem.

9. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
 10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.
- D. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.4 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AMETEK, Inc.; U.S. Gauge.
 - b. Ashcroft Inc.
 - c. Ernst Flow Industries.
 - d. Flo Fab Inc.
 - e. Palmer Wahl Instrumentation Group.
 - f. Tel-Tru Manufacturing Company.
 - g. Terrice, H. O. Co.
 - h. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
 - i. Weiss Instruments, Inc.
2. Standard: ASME B40.100.
3. Case: Liquid-filled type(s); cast aluminum or drawn steel; 4-1/2-inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi and kPa.
8. Pointer: Dark-colored metal.
9. Window: Glass
10. Ring: Stainless steel.
11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

B. Direct-Mounted, Plastic-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ashcroft Inc.
 - b. Flo Fab Inc.
 - c. Palmer Wahl Instrumentation Group.
 - d. Terrice, H. O. Co.
 - e. Weiss Instruments, Inc.
2. Standard: ASME B40.100.
3. Case: Sealed type; plastic 4-1/2-inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.

7. Dial: Non-reflective aluminum with permanently etched scale markings graduated in psi and kPa.
8. Pointer: Dark-colored metal.
9. Window: Glass.
10. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

C. Remote-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ashcroft Inc.
 - b. Palmer Wahl Instrumentation Group.
 - c. Terice, H. O. Co.
 - d. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
 - e. Weiss Instruments, Inc.
2. Standard: ASME B40.100.
3. Case: Liquid-filled type; cast aluminum or drawn steel 4-1/2-inch nominal diameter with back flange and holes for panel mounting.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2 ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi and kPa.
8. Pointer: Dark-colored metal.
9. Window: Glass.
10. Ring: Stainless steel.
11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

D. Remote-Mounted, Plastic-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ashcroft Inc.
 - b. Tel-Tru Manufacturing Company.
 - c. Terice, H. O. Co.
 - d. Weiss Instruments, Inc.
2. Standard: ASME B40.100.
3. Case: Sealed type; plastic 6-inch nominal diameter with back flange and holes for panel mounting.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi and kPa.
8. Pointer: Dark-colored metal.
9. Window: Glass.
10. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.5 GAGE ATTACHMENTS

- A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.
- B. Valves: Brass or stainless-steel needle, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

2.6 TEST PLUGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Flow Design, Inc.
 - 2. National Meter, Inc.
 - 3. Trerice, H. O. Co.
 - 4. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
 - 5. Weiss Instruments, Inc.
- B. Description: Test-station fitting made for insertion into piping tee fitting.
- C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.
- D. Thread Size: NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe thread.
- E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.
- F. Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber.

2.7 TEST-PLUG KITS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Flow Design, Inc.
 - 2. National Meter, Inc.
 - 3. Trerice, H. O. Co.
 - 4. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
 - 5. Weiss Instruments, Inc.
- B. Furnish **one** test-plug kit(s) containing **two** thermometer(s), one pressure gage and adapter, and carrying case. Thermometer sensing elements, pressure gage, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.
- C. Low-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range shall be at least 25 to 125 deg F.
- D. High-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range shall be at least 0 to 220 deg F.
- E. Pressure Gage: Small, Bourdon-tube insertion type with 2- to 3-inch- diameter dial and probe. Dial range shall be at least 0 to 200 psig.

- F. Carrying Case: Metal or plastic, with formed instrument padding.

2.8 SIGHT FLOW INDICATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Emerson Process Management; Brooks Instrument.
 - 2. Ernst Co., John C., Inc.
 - 3. Ernst Flow Industries.
 - 4. Penberthy; A Brand of Tyco Valves & Controls - Prophetstown.
- B. Description: Piping inline-installation device for visual verification of flow.
- C. Construction: Bronze or stainless-steel body, with sight glass and ball, flapper, or paddle wheel indicator, and threaded or flanged ends.
- D. Minimum Pressure Rating: 125 psig.
- E. Minimum Temperature Rating: 200 deg F.
- F. End Connections for NPS 2 and Smaller: Threaded.
- G. End Connections for NPS 2-1/2 and Larger: Flanged.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.
- B. Install remote-mounted pressure gages on panel.
- C. Install valve and snubber in piping for each pressure gage for fluids.
- D. Install test plugs in piping tees.
- E. Install thermometers in the following locations:
 - 1. Inlet and outlet of each domestic hot-water storage tank water heater.
- F. Install pressure gages in the following locations:
 - 1. Building water service entrance into tenant space.
 - 2. Inlet and outlet of each pressure-reducing valve.

3.2 CONNECTIONS

- A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3.3 ADJUSTING

- A. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCHEDULE

- A. Thermometers at inlet and outlet of each domestic hot-water storage tank heater shall be one of the following:
 1. Liquid-filled, bimetallic-actuated type.
 2. Direct-mounted, metal-case, vapor-actuated type.
 3. Compact-style, liquid-in-glass type.
 4. Direct-mounted, light-activated type.
 5. Test plug with EPDM self-sealing rubber inserts.
- B. Thermometer stems shall be of length to match thermowell insertion length.

3.5 THERMOMETER SCALE-RANGE SCHEDULE

- A. Scale Range for Domestic Cold-Water Piping: 0 to 100 deg F.
- B. Scale Range for Domestic Hot-Water Piping: 0 to 250 deg F.

3.6 PRESSURE-GAGE SCHEDULE

- A. Pressure gages at discharge of each water service into building tenant space shall be one of the following:
 1. Liquid-filled, Open-front, pressure-relief direct-mounted, metal case.
 2. Sealed direct-mounted, plastic case.
 3. Test plug with EPDM self-sealing rubber inserts.
- B. Pressure gages at inlet and outlet of each water pressure-reducing valve shall be one of the following:
 1. Liquid-filled Open-front, pressure-relief direct-mounted, metal case.
 2. Sealed direct-mounted, plastic case.
 3. Test plug with EPDM self-sealing rubber inserts.

3.7 PRESSURE-GAGE SCALE-RANGE SCHEDULE

- A. Scale Range for Water Service Piping: 0 to 160 psi and 0 to 1100 kPa.
- B. Scale Range for Domestic Water Piping: 0 to 160 psi and 0 to 1100 kPa.

END OF SECTION 220519

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SECTION 22 05 29 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following hangers and supports for plumbing system piping and equipment:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe positioning systems.

- B. Related Sections include the following:

1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Division 21 Section "**Wet-Pipe Sprinkler Systems**" for pipe hangers for fire-suppression piping.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.
- B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple pipes, capable of supporting combined weight of supported systems, system contents, and water.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 SUBMITTALS

- A. Product Data: For the following:
 1. Steel pipe hangers and supports.
 2. Thermal-hanger shield inserts.
 3. Powder-actuated fastener systems.
 4. Pipe positioning systems.

- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:
1. Trapeze pipe hangers. Include Product Data for components.
 2. Metal framing systems. Include Product Data for components.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
- B. Manufacturers:
1. B-Line Systems, Inc.; a division of Cooper Industries.
 2. Carpenter & Paterson, Inc.
 3. ERICO/Michigan Hanger Co.
 4. Grinnell Corp.
 5. National Pipe Hanger Corporation.
 6. PHD Manufacturing, Inc.
 7. Piping Technology & Products, Inc.
 8. Tolco Inc.
- C. Galvanized, Metallic Coatings: Pre-galvanized or hot dipped.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.
- E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

- A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. Power-Strut Div.; Tyco International, Ltd.
4. Thomas & Betts Corporation.
5. Tolco Inc.
6. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Manufacturers:

1. Carpenter & Paterson, Inc.
2. ERICO/Michigan Hanger Co.
3. PHS Industries, Inc.
4. Pipe Shields, Inc.
5. Rilco Manufacturing Company, Inc.
6. Value Engineered Products, Inc.

C. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with vapor barrier.

D. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.6 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

- a. Hilti, Inc.
- b. ITW Ramset/Red Head.
- c. Masterset Fastening Systems, Inc.
- d. MKT Fastening, LLC.
- e. Powers Fasteners.

- B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

- a. B-Line Systems, Inc.; a division of Cooper Industries.
- b. Empire Industries, Inc.
- c. Hilti, Inc.
- d. ITW Ramset/Red Head.
- e. MKT Fastening, LLC.
- f. Powers Fasteners.

2.7 PIPE POSITIONING SYSTEMS

- A. Description: IAPMO PS 42, system of metal brackets, clips, and straps for positioning piping in pipe spaces for plumbing fixtures for commercial applications.

B. Manufacturers:

1. C & S Mfg. Corp.
2. HOLDRITE Corp.; Hubbard Enterprises.
3. Samco Stamping, Inc.

2.8 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Non-staining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use padded hangers for piping that is subject to scratching.

- F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 18.
 2. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24, if little or no insulation is required.
 3. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8.
 4. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
 5. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.
 6. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8.
 7. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3.
 8. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30.
 9. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
- G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.
- H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. C-Clamps (MSS Type 23): For structural shapes.
 6. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 7. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.

8. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 9. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 10. Side-Beam Brackets (MSS Type 34): For sides of steel beams.
 11. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
 12. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- K. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
- L. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.
- M. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.
- N. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

3.2 HANGER AND SUPPORT INSTALLATION

- A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.
1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
 2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
- D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- F. Pipe Positioning System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. Refer to Division 22 Section "Plumbing Fixtures" for plumbing fixtures.
- G. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- I. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- J. Install lateral bracing with pipe hangers and supports to prevent swaying.
- K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, and flanges, NPS 2-1/2.
- L. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.
- N. Insulated Piping: Comply with the following:
1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits according to ASME B31.9 for building services piping.
 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
5. Insert Material: Length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers.
- B. Fit exposed connections together to form hairline joints.

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

- A. Touch Up: Clean abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 22 05 29

SECTION 22 05 33 - HEAT TRACING FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

1.2 SUMMARY

- A. This Section includes heat tracing for piping systems.

1.3 REFERENCES

- A. FM Factory Mutual Research Corporation
- B. IEEE 515 Institute of Electrical and Electronics Engineers
- C. NEC National Electric Code (NFPA 70)
- D. NEMA National Electrical Manufacturers Association
- E. UL 746B Underwriters' Laboratories, Inc.
- F. ANSI American National Standards Institute

1.4 QUALITY ASSURANCE

- A. The electric heat-tracing system shall conform to the specification. It shall be designed, manufactured, and tested in accordance with the applicable requirements of the latest edition of the following codes and standards.
- B. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum 3 year's experience.
- C. All self regulating cable equipment furnished under this section shall be supplied by a single manufacturer.
- D. UL listed self regulating cable and thermostats.

1.5 SUBMITTAL

- A. Submit Catalog Cuts for the following in accordance with the requirements of Shop Drawings, Catalog Cuts, and Samples of Division 1 - GENERAL PROVISIONS:
 - 1. Heat tracing cables for each type of system.
 - 2. Splice kit materials and installation procedures.
 - 3. Submit manufacturer certified field test reports for the systems.
 - 4. Accurately record actual locations of heating cable, thermostats and branch circuit connections.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Chromalox (Faber Associates, Clifton)
- B. Approved equal

2.2 HEAT TRACE SYSTEMS

A. Piping Heat Trace

1. Self-Regulating Heating Cables

- a. All heat-tracing systems for use at temperatures up to a continuous exposure (maintain) of 250°F (121°C) and intermittent exposure temperature of 375°F (190°C) shall use a self-regulating heating cable.
 - 1) Self-regulating heating cable shall vary its power output relative to the temperature of the surface of the pipe or the vessel. The cable shall be designed such that it can be crossed over itself and cut to length in the field.
 - 2) Self-regulating heating cable shall be designed for a useful life of 20 years or more with "power on" continuously.
 - 3) All cables shall be capable of passing a 1.6 kV dielectric test for one minute after undergoing a 10 ft-lb. impact (IEEE 515-1997 test 4.1.8)

2. Freeze Protection Systems with No Steam Exposure

- a. 5 Watt / ft heating cable is to be used on pipe sizes up to 4" with at least 1" of insulation. The cable shall be rated for 277 VAC and shall be installed per manufacturer's instructions. For larger pipe sizes and valves, additional runs of cable may be required or the cable may need to be spiraled on the pipe to meet minimum heat loss requirements. For assistance with determining heat loss requirements please contact heat trace manufacturer.
- b. The heating cable shall consist of two 16 AWG or larger nickel-plated copper bus wires, embedded in a self-regulating polymeric core that controls power output so that the cable can be used directly on plastic or metallic pipes. Cables shall have a temperature identification number (T-rating) without the use of thermostats of the following.

Heating Cable	T-rating	Maximum Temperature
5 W/ft	T6	185°F (85°C)

- c. The heating cable shall have a tinned copper braid with a resistance less than 8 mΩ/ft as determined by metallic covering conductivity test (IEEE 515-1997 test 4.1.13). The braid may be protected from chemical attack and mechanical abuse by an optional polyolefin or fluoropolymer outer jacket.
- d. In order to provide rapid heat-up, and to prevent overheating of fluids and plastic pipe, the heating cable shall have the following minimum self-regulating indices:

Heating Cable	S.R. Index (W/°F)	S.R. Index (W/°C)
5 W/ft	-0.045	-0.080

- e. The self-regulating index is the rate of change of power output in watts per degree Fahrenheit or watts per degree Celsius, as measured between the temperatures of 50°F (10°C) and 100°F (38°C) and confirmed by the type test and published data sheets.
- f. In order to facilitate longer circuit lengths and smaller breaker sizing. The heating cable shall have the following maximum inrush current at 50°F (10°C).

Heating Cable	Maximum Inrush @ time = 1 sec	Maximum Inrush @ time = 10 sec	Maximum Inrush @ time = 300 sec
5 W/ft, 120V	155 mA/ft	128 mA/ft	66 mA/ft
5 W/ft, 240V	92 mA/ft	80 mA/ft	33 mA/ft

- g. In order to ensure that the self-regulating heating cable does not increase power output when accidentally exposed to high temperatures, resulting in thermal runaway and self-ignition, the cable shall produce less than 10 percent of rated power when energized and heated to 302°F (150°C) for 30 minutes. After this test, if the cable is allowed to cool to 50°F (10°C) and is reenergized, it must not have an increasing power output leading to thermal runaway.
- h. In order to confirm 3.1B, the self-regulating heating cable shall maintain between 75 and 110 percent of its original power output after having been cycled 500 times between 50°F (10°C) and 150°F (65°C), allowing no more than 12 minutes of dwell time at each temperature.
- i. The heating cable shall have the following third party approvals:
 - 1) UL listed
 - a) Ordinary areas
 - b) Fire Protection System Piping
 - 2) FM approved
 - a) Ordinary areas
 - b) Class I, Division 2 groups B, C, D
 - c) Class II, Division 2 groups F, G
 - d) Class III, Division 2
- j. The heating cable shall be type SRL with continuous exposure (maintain) capability up to 150°F (65°C) and continuous exposure capability up to 185°F (85°C) with power off, as manufactured by Chromalox.

3. Termination for Self-Regulating Heating Cables

- a. All connection components used to terminate self-regulating heating cables, including power connectors, splices, tees, and connectors, shall be approved for the respective area classification and approved as a system with the particular type of heating cable in use. Under no circumstances shall terminations be used which are manufactured by a vendor other than the cable manufacture.
- b. In order to keep connections dry, components shall be rated NEMA 4X.

4. Control, Monitoring and Power Distribution Systems

- a. A UL listed microprocessor based temperature control and monitoring system shall be used. The controller shall accept RTD sensor inputs. The system shall be compatible with self-regulating and MI cables and shall have the following features.
 - 1) Hoffman wall mounted design NEMA 4X steel enclosure (12" x 10" x 6")
 - 2) Supply voltage: 277 Vac single phase.
 - 3) 277/120 VAC, 250 VA primary and secondary fusing control power transformer.
 - 4) Field power connection terminal block must accept RTD sensor input for up to 8 circuits.
 - 5) Control must operate in -10-120°F environments. Includes a internal space heater with thermostat for outdoor or unheated area installations
 - 6) Solid state relay rated 25A at 120°F (40°C) output.
 - 7) Process, deviation, band, high/low and latching/non-latching (manual/automatic reset) programmable temperature alarms must be provided for each of the 8 inputs with one common alarm output to FMS.
 - 8) On/Off and PID control modes. PID mode must have one touch self-tuning feature such as Chromalox, 3380 multiloop controller
- b. Control and Monitoring Systems shall be model # 4439-4X-4KW-277v as supplied by Chromalox.
- c. Panels shall be fed with 277V single phase 20 amp circuits.
- d. Provide Ground Fault Interrupter circuit breakers or devices for all circuits used for the heat trace systems.
- e. Multiple panels may be placed on a single circuit in parallel, however, total heating cable load not to exceed max breaker capacity, taking inrush loads into account. For this application, the maximum allowable combined length of cable (SRL5-2C) is 360 ft on a 20A breaker.
- f. This Heat trace system is designed to be "modular" to allow panels to be located in close proximity to the various eyewash, drain traps, potable water, and other stations throughout the terminal. This is to minimize wiring from the various locations, and to provide alarm points (which may be grouped in parallel to establish "zones") through out the area to signal the BMS.

2.3 ACCESSORIES

A. Thermostat

1. Thermostat shall be ambient sensing.
2. Thermostat shall be bulb and capillary type.
3. Thermostat shall have a capillary tube at least 8 feet long.
4. Thermostat shall be set to activate at 35°F.

B. SMC – 120G: Ice Melting Control System:

1. Fully automated system requiring no operator settings or adjustments.
2. Solid State Controller with 10 amp relay output contact
3. Ambient thermostat to lock out heater above 35°F
4. System shall have no timers
5. Relay contacts for alarm and 'system on' indicators for interfacing with FMS.

2.4 COORDINATION

- A. Coordinate installation of heating cable with other trades

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Installer to verify field measurements are as shown on Drawings.
- B. Installer to verify that required utilities are available, in proper location and ready for use.
- C. Beginning of installation means installer accepts conditions.

3.2 INSTALLATION

- A. Complete installation shall conform appropriate local codes and shall be in accordance with manufacturer's specification.
- B. Install cable heaters in accordance with manufacturer's detailed layout drawings.
- C. Provide 'as wired' drawing of the system.
- D. All roof penetrations shall be coordinated with Architect and submit detail for approval before installation.

3.3 FIELD QUALITY CONTROL

- A. Test continuity of heating cable.
- B. Perform insulation resistance (megger) test on each MI cable heater before, during, and after concrete pour. Minimum acceptable megger reading shall be 10 megohms.
- C. Measure voltage and current at each unit.
- D. Submit written test report showing values measured on each test for each cable.
- E. Perform operational test in the presence of the design team.

END OF SECTION 22 05 33

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SECTION 22 05 48 - VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
1. Isolation pads.
 2. Isolation mounts.
 3. Restrained elastomeric isolation mounts.
 4. Freestanding and restrained spring isolators.
 5. Housed spring mounts.
 6. Elastomeric hangers.
 7. Spring hangers.
 8. Spring hangers with vertical-limit stops.
 9. Pipe riser resilient supports.
 10. Resilient pipe guides.
 11. Seismic snubbers.
 12. Restraining braces and cables.
 13. Steel and inertia, vibration isolation equipment bases.

1.3 DEFINITIONS

- A. IBC: International Building Code.
- B. ICC-ES: ICC-Evaluation Service.

1.4 PERFORMANCE REQUIREMENTS

- A. Seismic-Restraint Loading:
1. Site Class as Defined in the IBC: "As per site specific study."
 2. Assigned Seismic Use Group or Building Category as Defined in the IBC: Seismic Use Group II (Occupancy Category III).
 - a. Component Importance Factor: See above
 - b. Component Response Modification Factor: See above
 - c. Component Amplification Factor: See above
 3. Design Spectral Response Acceleration at Short Periods (0.2 Second): 0.3g, see note "**
 4. Design Spectral Response Acceleration at 1-Second Period: 0.15g, see note "**.

** Per site specific study, "the design spectrum must be considered in its entire spectrum of periods and supersede any generic site classification. The values for SA at 0.2 sec, S_{DS} (0.3g), and SA at 1.0 sec, S_{D1} (0.15g), in this recommendation cannot be used to generate a response spectrum for the site."

1.5 SUBMITTALS

- A. Product Data: For the following:
1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
 2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
 - a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
 - b. Annotate to indicate application of each product submitted and compliance with requirements.
 3. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.
- B. Delegated-Design Submittal: For vibration isolation and seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic forces required to select vibration isolators, seismic restraints, and for designing vibration isolation bases.
 2. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system has been examined for excessive stress and that none will exist.
 3. Vibration Isolation Base Details: Detail overall dimensions, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.
 4. Seismic-Restraint Details:
 - a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
 - b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
 - c. Preapproval and Evaluation Documentation: By an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).
- C. Coordination Drawings: Show coordination of seismic bracing for plumbing piping and equipment with other systems and equipment in the vicinity, including other supports and seismic restraints.
- D. Welding certificates.
- E. Qualification Data: For professional engineer and testing agency.

- F. Field quality-control test reports.
- G. Operation and Maintenance Data: For air-mounting systems to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
- B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
- C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproved by ICC-ES, or preapproved by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Kinetics Noise Control.
 - 2. Mason Industries.
 - 3. Vertex.
- B. General
 - 1. Provide vibration isolators in accordance with the load distribution to produce uniform minimum deflection as specified on the schedule.
 - 2. All static deflections stated are the minimum acceptable deflection for the vibration isolator under actual load as shown on the drawings. Isolators selected purely on the basis of rated deflection are not acceptable. Where static deflections are not specified, provide minimum 2 inches static deflection for rotating and reciprocating equipment.
 - 3. Where specific type of vibration isolation hardware equipment is not shown or specified, furnish isolators recommended by the isolation manufacturer compatible with equipment arrangements shown.
- C. Neoprene Pads (Type NP): Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.
 - 1. Resilient Material: Oil and water-resistant neoprene
 - 2. Type: Mason Industries "Super W" or approved equal.

- D. Neoprene Mounts (Type NM): Double-deflection type, with molded, oil-resistant rubber, hermetically sealed compressed fiberglass, or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.
1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
 2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.
 3. Type: Mason Industries "ND" or approved equal.
- E. Restrained Elastomeric Mounts (Type REM): All-directional mountings with seismic restraint.
1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
 2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.
- F. Spring Isolators (Type SI): Freestanding, laterally stable, open-spring isolators.
1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch- thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig
 6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.
 7. Type: Mason Industries "SLF" or approved equal.
- G. Restrained Spring Isolators (Type RSI): Freestanding, steel, open-spring isolators with seismic or limit-stop restraint.
1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to 1/4-inch- thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
 2. Restraint: Seismic or limit-stop as required for equipment and authorities having jurisdiction.
 3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 7. Type: Mason Industries "SLRS" or approved equal.

- H. Housed Spring Mounts: Housed spring isolator with integral seismic snubbers.
1. Housing: Ductile-iron or steel housing to provide all-directional seismic restraint.
 2. Base: Factory drilled for bolting to structure.
 3. Snubbers: Vertically adjustable to allow a maximum of 1/4-inch travel up or down before contacting a resilient collar.
- I. Neoprene Hangers (Type NH): Double deflection neoprene-in-shear hanger.
1. Static Deflection: 0.3 to 0.5 inch.
 2. Frame: A neoprene neck bushing shall be provided where the hanger rod passes through the hanger housing to prevent the rod from contacting the hanger housing.
 3. Housing: The diameter of the hole in the housing shall be sufficient to permit the hanger rod to swing through a 30-degree arc before contacting the hanger housing.
 4. Type Mason "HD" or approved equal.
- J. Spring Hangers (Type SH): Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.
1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
 2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
 7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.
 8. Type: Mason Industries "30N" or approved equal.
- K. Spring Hangers with Vertical-Limit Stop (Type SHL): Combination coil-spring and elastomeric-insert hanger with spring and insert in compression and with a vertical-limit stop.
1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
 2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
 7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
 8. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.
 9. Type: Mason Industries "PC30N" or approved equal.

- L. Pipe Riser Resilient Support (Type): All-directional, acoustical pipe anchor consisting of 2 steel tubes separated by a minimum of 1/2-inch thick neoprene. Include steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions. Design support for a maximum load on the isolation material of 500 psig and for equal resistance in all directions. Type: Mason Industries "ADA" or approved equal.
- M. Resilient Pipe Guides (Type RPG): Telescopic arrangement of 2 steel tubes or post and sleeve arrangement separated by a minimum of 1/2-inch thick neoprene. Where clearances are not readily visible, a factory-set guide height with a shear pin to allow vertical motion due to pipe expansion and contraction shall be fitted. Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements. Type: Mason Industries "VSG" or approved equal.
- N. Split Wall Seal (Type SWS): Two bolted pipe halves with minimum 3/4" (19mm) thick neoprene sponge bonded to the inner faces. The seal shall be tightened around the pipe to eliminate clearance between the inner sponge face and the piping. Concrete may be packed around the seal to make it integral with the floor, wall or ceiling if the seal is not already in place around the pipe prior to the construction of the building member. Seals shall project a minimum of 1" (25mm) past either face of the wall. Seals shall be Mason Industries Type SWS or approved equal.

2.2 VIBRATION ISOLATION EQUIPMENT BASES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Kinetics Noise Control.
 - 2. Mason Industries.
 - 3. Vibrex.
- B. Steel Base: Factory-fabricated, welded, structural-steel bases and rails.
 - 1. Design Requirements: Lowest possible mounting height with not less than 1-inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.
 - a. Include supports for suction and discharge elbows for pumps.
 - 2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Bases shall have shape to accommodate supported equipment.
 - 3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.
 - 4. Type: Mason Industries "WFSL" or approved equal.

- C. Concrete Inertia Base: Factory-fabricated, welded, structural-steel bases and rails ready for placement of cast-in-place concrete.
1. Design Requirements: Lowest possible mounting height with not less than 1-inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.
 - a. Include supports for suction and discharge elbows for pumps.
 - b. Base shall have minimum weight 1-1/2 times weight of equipment or as noted.
 - c. In general, base depth shall be a minimum of 1/12th of the longest dimension of the base, but not less than 6 inches.
 - d. Forms shall include minimum concrete reinforcement consisting of half-inch bars or angles welded in place on 6 inch centers running both ways in a layer 1-1/2 inches above the bottom, or additional steel members to hold anchor-bolt sleeves when the anchor bolts fall in concrete locations.
 2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Bases shall have shape to accommodate supported equipment.
 3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.
 4. Fabrication: Fabricate steel templates to hold equipment anchor-bolt sleeves and anchors in place during placement of concrete. Obtain anchor-bolt templates from supported equipment manufacturer.
 5. Type: Mason Industries "K" or approved equal.

2.3 SEISMIC-RESTRAINT DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ISAT (International Seismic Application Technology)
 2. Amber/Booth Company, Inc.
 3. California Dynamics Corporation.
 4. Cooper B-Line, Inc.; a division of Cooper Industries.
 5. Hilti, Inc.
 6. Kinetics Noise Control.
 7. Loos & Co.; Cableware Division.
 8. Mason Industries.
 9. TOLCO Incorporated; a brand of NIBCO INC.
 10. Unistrut; Tyco International, Ltd.
- B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction.
1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- C. Snubbers: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.
1. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.
 2. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.

3. Maximum 1/4-inch air gap, and minimum 1/4-inch thick resilient cushion.
- D. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.
- E. Restraint Cables: ASTM A 492 stainless-steel cables with end connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.
- F. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.
- G. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.
- H. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.
- I. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.
- J. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.
- K. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.4 FACTORY FINISHES

- A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.
 1. Powder coating on springs and housings.
 2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
 3. Baked enamel or powder coat for metal components on isolators for interior use.
 4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

- A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction.
- B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. General Requirements

1. Vibration isolation manufacturer's representative shall supervise and inspect all installed isolation hardware and generate a written punchlist for the Construction Manager, along with corrective measures required. Submit inspection report.
2. The installation or use of vibration isolators must not cause any change in position of equipment, piping, or ducts that result in stresses in any connections or misalignment of shafts or bearings. Equipment shall be maintained in a rigid position during installation. The load shall not be transferred to the isolators until the installation is complete and in operational condition.
3. Do not install any mechanical equipment or piping that makes rigid contact with the "building" unless it is approved in this specification or by the Commissioner. "Building" includes, but is not limited to, slabs, beams, columns, walls, partitions, ceilings, studs, ceiling framing, and suspension systems. Resiliently-isolated piping shall not contact building construction or other equipment or items.
4. Prior to installation, the Contractor shall bring to the Commissioner's attention any conflicts between trades that will result in unavoidable rigid contact of equipment, piping, or ducts with the building. Corrective work after installation, necessitated by unresolved conflicts before installation, shall be at the Contractor's expense.
5. The Contractor shall obtain written instructions from the vibration isolation manufacturer as to the proper selection, installation, and adjustment of all vibration isolation devices.
6. No equipment unit shall bear directly on vibration isolators unless its own frame is suitably rigid to span between isolators and such direct support is approved by the equipment manufacturer. This provision shall apply whether or not a base frame is called for on the schedule. In the case that a base frame is required for the unit because of the equipment manufacturer's requirements and is not specifically called for on the equipment schedule, a base frame recommended by the equipment manufacturer shall be provided at no additional expense.
7. Unless otherwise indicated, there is to be a minimum operating clearance of 1" between inertia bases or steel frame bases and the floor beneath the equipment. Position isolator mounting brackets and adjust isolators so that the required clearance is maintained. The clearance space shall be cleaned thoroughly by the Contractor to ensure that no construction debris has been left to short-circuit or restrict the proper operation of the vibration isolation system.

8. Provide a minimum of 1" clearance between the building structure (walls, floors, and ceilings) and vibration isolated supports, pipes, and equipment.
9. Ceiling-suspended equipment shall be supported from the building structure, such as trusses, girders, beams, or joists. If necessary, provide heavy extra substructure between the building's existing heavy structure in order to support vibration-isolated equipment. Do not suspend equipment from roof decks or floors without approval. Connect vibration isolation hangers directly to, or as close as possible to, structure that is stiff. Hanger housings should be free to rotate a full 360 degrees about the rod axis without contacting any object.
10. Any bracing or supports for mechanical piping, and equipment shall not bridge or reduce the effectiveness of vibration isolators.

B. Vibration Isolated-Equipment

1. Locations of all vibration isolation equipment shall be selected for ease of inspection and adjustment as well as for proper operation.
2. Installation of vibration isolation equipment shall be in accordance with the manufacturer's written instructions.
3. Unless otherwise noted, mount motors on rigid base common with equipment or supported from equipment frame.
4. Fasten all vibration isolators to the structure, not to floor diaphragms or lightweight components. Use bolts where holes are provided in the mounting flanges; otherwise, adhere using structural adhesive. Where mounting flanges are steel, use neoprene grommets and washers under anchor bolts. Where vibrating elements are to be fastened to structural elements provide connection details for review.
5. All vibration-isolated equipment shall be connected to the adjacent pipework system via a flexible connection positioned to avoid a direct connection between equipment and mounting surface.
6. Do not use vibration isolation components to straighten or connect misaligned sections of piping.
7. Inspect all vibration-isolated equipment, coordinate the work of all involved trades, and verify that vibration isolators are not short-circuited by drain lines, conduits, control tubing, duct connections, pipe connections, etc.
8. Adjust all leveling bolts and hanger rod bolts so that the isolated equipment is level and in proper alignment with connecting ducts or pipes.
9. Hanger rods shall be aligned and free of contact with hanger box.
10. Align spring isolation hanger rods to clear the hanger box under all operating conditions.
11. Level vibration isolated equipment under rated design operating conditions while maintaining the isolation criteria. Isolators shall be plumb and aligned to preclude misalignment or undesired contact during operation.

C. Flexible Pipe Connections

1. Install flexible pipe connections in accordance with the manufacturer's instructions.
2. Install flexible pipe connectors on pipes connected to equipment supported by vibration isolators or as indicated on drawings. Accomplish structural work and provide equipment required to control expansion and contraction of piping, loops, pipe offsets, and swing joints and provide type expansion joints where required. Install flexible connectors at right angles to primary displacement of vibration isolation. Install one end immediately adjacent to isolated equipment.
3. Flexible pipe connections shall be installed wherever pipes pass across an Acoustical Isolation Joint (AIJ) between isolated and non-isolated structures, or between independently isolated structures.
4. Flexible connectors shall be selected to suit the system temperature, pressure, and fluid type. Connectors with threaded ends shall be installed with unions of the same material as the piping system in which they are installed. Connectors shall be installed to be free from torsional stress.
5. No rods or cables shall be used to control extension of the connector; piping on both sides of the connector shall be anchored and supported to avoid strain on connector.

D. Resilient Penetration Sleeve/Seals

1. Wherever isolation pipes penetrate construction, resilient pipe sleeves shall be used and resilient pipe anchors and guides shall be used wherever necessary.
2. Isolated pipes that penetrate the building construction shall be isolated from the building by using resilient penetration sleeves/seals.
3. Penetration seals shall maintain an airtight seal around the penetrating element and shall prevent rigid contact between the penetrating element and the building structure. Fit the sleeve tightly to the building construction and seal airtight on both sides of the construction penetrated with acoustical sealant.

E. All plumbing, including all water closet carriers, sink & urinal supports located in bathrooms adjacent to the Light Box and Dark Box Theatres and associated Control Rooms shall be vibration isolated from the building structure as specified herein.

F. No rigid connections between the plumbing systems and the building structure shall be made that degrades the noise and vibration control system herein specified.

G. Services Penetrations

1. Piping: Where a pipe penetrates acoustical rated partitions (designated on architectural drawings) and mechanical room wall and slab create an acoustic seal around the pipes described herein and shown on the mechanical drawings. Insert a flanged pipe sleeve and seal the pipe sleeve into the partition with acoustic sealant. If the gap between the pipe and the pipe sleeve exceeds 1/2 inch, pack the gap with fiberglass and cover the entire joint with an 18 gauge metal flange or 5/8 inch gypsum board cover plate. Fully bed the flange or cover plate in non-hardening acoustical sealant. If the gap between the pipe and the pipe sleeve is less than 1/2 inch, pack the gap with fiberglass and sealed with non-hardening acoustical sealant backed by foam rod.
2. Refer to the architectural drawings for locations of acoustical rated partitions.

H. Separate snubbers shall be provided for all floor-mounted equipment on open-type (un-restrained) spring mounts. Provide a minimum of four snubbers at each item of equipment. Snubbers shall not be in contact during normal equipment operation. Number, size, and method of installation shall be as recommended by the isolator supplier.

- I. Equipment Restraints:
1. Install seismic snubbers on plumbing equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
 2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inches .
 3. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction providing required submittals for component.
- J. Piping Restraints:
1. Comply with requirements in MSS SP-127.
 2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
 3. Brace a change of direction longer than 12 feet.
- K. Install cables so they do not bend across edges of adjacent equipment or building structure.
- L. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction providing required submittals for component.
- M. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- N. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- O. Drilled-in Anchors:
1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
- P. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
- Q. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
- R. Set anchors to manufacturer's recommended torque, using a torque wrench.
- S. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.

3.4 SERVICES CROSSING ACOUSTIC ISOLATION JOINTS (AIJS)

- A. All building services which cross the Acoustic Isolation Joints shall incorporate resilient details and/or resilient supports in order to maintain the performance of the isolation system. The requirement is to minimize the transmission of acoustic energy across the joint.
- B. All pipework (wet & dry) shall incorporate flexible details and supports in order to minimize vibration transmission across isolation joints. The first three supports on each side of the AIJ are to be isolated,
- C. Services which do not serve the space on the inner side of the acoustic isolation joint shall not be routed across the AIJ surrounding that space. Detailing of any other services crossing Acoustic Isolation Joints (AIJ) shall be agreed with the Acoustic Consultant prior to installation.

3.5 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Division 22 Section "Domestic Water Piping" for piping flexible connections.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections:
 - 1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
 - 2. Schedule test with the Commissioner, before connecting anchorage device to restrained component (unless post-connection testing has been approved), and with at least seven days' advance notice.
 - 3. Obtain Commissioner's approval before transmitting test loads to structure. Provide temporary load-spreading members.
 - 4. Test at least four of each type and size of installed anchors and fasteners selected by Commissioner.
 - 5. Test to 90 percent of rated proof load of device.
 - 6. Measure isolator restraint clearance.
 - 7. Measure isolator deflection.
 - 8. Verify snubber minimum clearances.
 - 9. Air-Mounting System Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 10. Air-Mounting System Operational Test: Test the compressed-air leveling system.
 - 11. Test and adjust air-mounting system controls and safeties.
 - 12. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.
- C. Remove and replace malfunctioning units and retest as specified above.
- D. Prepare test and inspection reports.

3.7 ADJUSTING

- A. Adjust isolators after piping system is at operating weight.

- B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.
- C. Adjust active height of sprint isolators.
- D. Adjust restraints to permit free movement of equipment within normal mode of operation.

3.8 PLUMBING VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE SCHEDULE

Equipment	Isolator Type	Minimum Static Deflection	Base Type
Base mounted pumps	SI	2"	CIB
Inline pumps and motors – ceiling hung	SH	2"	
All water closet carriers, sink & urinal supports.	Type NM (Double Deflection Neoprene Mounts)	0.35"	
All pipework located adjacent to the Theatres and Control Rooms.	Type NM (Neoprene Mounts) or Type NH (Neoprene Hangers.	0.35"	
All pipework passing through floor slabs, walls and ceilings at bathrooms adjacent to the the Theatres and Control Rooms.	Type SWS (Split Wall Seal)		
All pipework passing through floor slabs, walls and ceilings at bathrooms adjacent to the the Theatres and Control Rooms.	Type RPG (Resilient Pipe Guide)	0.35"	
Piping: Isolate all piping within 50 ft of vibrating equipment or within the mechanical rooms, whichever is greater.	SHL	0.35"	

END OF SECTION 22 05 48

SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Equipment labels.
- 2. Pipe labels.
- 3. Stencils.
- 4. Valve tags.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Plastic Labels for Equipment:

- 1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- 2. Letter Color: White.
- 3. Background Color: Black.
- 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
 2. Lettering Size: At least 1-1/2 inches high.

2.3 STENCILS

- A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; and minimum letter height of 3/4 inch for access panel and door labels, equipment labels, and similar operational instructions.
1. Stencil Material: Aluminum.
 2. Stencil Paint: Exterior, gloss, acrylic enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
 3. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1 unless otherwise indicated.

2.4 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 2. Fasteners: Brass S-hook.

- B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch (A4) bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
1. Valve-tag schedule shall be included in operation and maintenance data.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels with painted, color-coded bands or rectangles, complying with ASME A13.1 on each piping system.

1. Identification Paint: Use for contrasting background.
2. Stencil Paint: Use for pipe marking.

- B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, and plenums.

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

- C. Pipe Label Color Schedule:

1. Domestic Water Piping:
 - a. Background Color: Blue.
 - b. Letter Color: White.
2. Sanitary Waste and Storm Drainage Piping:
 - a. Background Color: Brown.

- b. Letter Color: White.

3.4 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
 - 1. Valve-Tag Size and Shape:
 - a. Cold Water: 2 inches round.
 - b. Hot Water: 2 inches round.
 - 2. Valve-Tag Color:
 - a. Cold Water: Natural.
 - b. Hot Water: Natural.
 - 3. Letter Color:
 - a. Cold Water: Blue.
 - b. Hot Water: Red.

END OF SECTION 22 05 53

SECTION 22 07 00 - PLUMBING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Insulation Materials:
 - a. Cellular glass.
 - b. Flexible elastomeric.
 - c. Mineral fiber.
- 2. Insulating cements.
- 3. Adhesives.
- 4. Mastics.
- 5. Lagging adhesives.
- 6. Sealants.
- 7. Factory-applied jackets.
- 8. Tapes.
- 9. Securements.
- 10. Corner angles.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets both factory and field applied, if any.
- B. LEED Submittal:
 - 1. Product Data for Credit EQ 4.1: For adhesives and sealants, including printed statement of VOC content.
- C. Shop Drawings:
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail insulation application at pipe expansion joints for each type of insulation.
 - 3. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 - 4. Detail removable insulation at piping specialties, equipment connections, and access panels.
 - 5. Detail application of field-applied jackets.
- D. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use. Sample sizes are as follows:

1. Sample Sizes:
 - a. Preformed Pipe Insulation Materials: 12 inches long by NPS 2.
 - b. Sheet Form Insulation Materials: 12 inches square.
 - c. Jacket Materials for Pipe: 12 inches long by NPS 2.
 - d. Sheet Jacket Materials: 12 inches square.
 - e. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

E. Qualification Data: For qualified Installer.

F. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

G. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed a craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application and equipment Installer for equipment insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Products: Subject to compliance with requirements, provide one of the following products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cell-U-Foam Corporation; Ultra-CUF.
 - b. Pittsburgh Corning Corporation; Foamglas Super K.
 - 2. Special-Shaped Insulation: ASTM C 552, Type III.
 - 3. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
 - 4. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
 - 5. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
- G. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
 - 1. Products: Subject to compliance with requirements, provide one of the following products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Aeroflex USA Inc.; Aerocel.
 - b. Armacell LLC; AP Armaflex.
 - c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.
- H. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following products that may be incorporated into the Work include, but are not limited to, the following:
 - a. CertainTeed Corp.; Duct Wrap.
 - b. Johns Manville; Microlite.
 - c. Manson Insulation Inc.; Alley Wrap.
 - d. Owens Corning; All-Service Duct Wrap.

2.2 INSULATING CEMENTS

- A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

1. Products: Subject to compliance with requirements, provide one of the following products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Insulco, Division of MFS, Inc.; Triple I.
 - b. P. K. Insulation Mfg. Co., Inc.; Super-Stik.

- B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

1. Products: Subject to compliance with requirements, provide one of the following product that may be incorporated into the Work include, but are not limited to, the following:
 - a. P. K. Insulation Mfg. Co., Inc.; Thermal-V-Kote.

- C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

1. Products: Subject to compliance with requirements, provide one of the following products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Insulco, Division of MFS, Inc.; SmoothKote.
 - b. P. K. Insulation Mfg. Co., Inc.; PK No. 127, and Quik-Cote.
 - c. Rock Wool Manufacturing Company; Delta One Shot.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to it and to surfaces to be insulated, unless otherwise indicated.

- B. Cellular-Glass, Phenolic, Polyisocyanurate, and Polystyrene Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F.

1. Products: Subject to compliance with requirements, provide one of the following products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Products, Division of ITW; CP-96.
 - b. Foster Products Corporation, H. B. Fuller Company; 81-33.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

- C. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, provide one of the following products that may be incorporated into the Work include, but are not limited to, the following:

- a. Aeroflex USA Inc.; Aero seal.
- b. Armacell LCC; 520 Adhesive.
- c. Foster Products Corporation, H. B. Fuller Company; 85-75.
- d. RBX Corporation; Rubatex Contact Adhesive.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following products that may be incorporated into the Work include, but are not limited to, the following:

- a. Childers Products, Division of ITW; CP-82.
- b. Foster Products Corporation, H. B. Fuller Company; 85-20.
- c. ITW TACC, Division of Illinois Tool Works; S-90/80.
- d. Marathon Industries, Inc.; 225.
- e. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide one of the following products that may be incorporated into the Work include, but are not limited to, the following:

- a. Childers Products, Division of ITW; CP-82.
- b. Foster Products Corporation, H. B. Fuller Company; 85-20.
- c. ITW TACC, Division of Illinois Tool Works; S-90/80.
- d. Marathon Industries, Inc.; 225.
- e. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

- B. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.
1. Products: Subject to compliance with requirements, provide one of the following products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Products, Division of ITW; CP-30.
 - b. Foster Products Corporation, H. B. Fuller Company; 30-35.
 - c. ITW TACC, Division of Illinois Tool Works; CB-25.
 - d. Marathon Industries, Inc.; 501.
 - e. Mon-Eco Industries, Inc.; 55-10.
 2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
 3. Service Temperature Range: 0 to 180 deg F.
 4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
 5. Color: White.

2.5 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.
1. For indoor applications, use lagging adhesives that have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Products: Subject to compliance with requirements, provide one of the following products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Products, Division of ITW; CP-52.
 - b. Foster Products Corporation, H. B. Fuller Company; 81-42.
 - c. Marathon Industries, Inc.; 130.
 - d. Mon-Eco Industries, Inc.; 11-30.
 - e. Vimasco Corporation; 136.
 3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over equipment and pipe insulation.
 4. Service Temperature Range: Minus 50 to plus 180 deg F.
 5. Color: White.

2.6 SEALANTS

- A. Joint Sealants:
1. Joint Sealants for Cellular-Glass, Phenolic, and Polyisocyanurate Products: Subject to compliance with requirements, provide one of the following products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Products, Division of ITW; CP-76.
 - b. Foster Products Corporation, H. B. Fuller Company; 30-45.
 - c. Marathon Industries, Inc.; 405.
 - d. Mon-Eco Industries, Inc.; 44-05.
 - e. Pittsburgh Corning Corporation; Pittseal 444.
 - f. Vimasco Corporation; 750.

B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide following product that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Products, Division of ITW; CP-76.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.

2.8 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
 - b. Compac Corp.; 104 and 105.
 - c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
 - d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
1. Products: Subject to compliance with requirements, provide one of the following products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
 - b. Compac Corp.; 110 and 111.
 - c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
 - d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.
 2. Width: 3 inches.
 3. Thickness: 6.5 mils.
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.9 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, provide one of the following products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Products; Bands.
 - b. PABCO Metals Corporation; Bands.
 - c. RPR Products, Inc.; Bands.
2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 1/2 inch wide with wing or closed seal.
3. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.
4. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. Products: Subject to compliance with requirements, provide one of the following products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series T.
 - 2) GEMCO; Perforated Base.
 - 3) Midwest Fasteners, Inc.; Spindle.
 - b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 - c. Spindle: zinc-coated, low carbon steel, fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
 - d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

5. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
 - a. Products: Subject to compliance with requirements, provide one of the following products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) AGM Industries, Inc.; RC-150.
 - 2) GEMCO; R-150.
 - 3) Midwest Fasteners, Inc.; WA-150.
 - 4) Nelson Stud Welding; Speed Clips.
 - b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.
- C. Wire: 0.062-inch soft-annealed, galvanized steel.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. C & F Wire.
 - b. Childers Products.
 - c. PABCO Metals Corporation.
 - d. RPR Products, Inc.

2.10 CORNER ANGLES

- A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
 1. Verify that systems and equipment to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application. Before insulating, apply a corrosion resistant coating to surfaces as follows:

1. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- B. Mix insulating cements with clean potable water.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 1. Install insulation continuously through hangers and around anchor attachments.
 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

- L. Install insulation with factory-applied jackets as follows:
1. Draw jacket tight and smooth.
 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above ambient services, do not install insulation to the following:
1. Testing agency labels and stamps.
 2. Nameplates and data plates.
 3. Cleanouts.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant.
 3. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Interior Wall and Partition Penetrations That Are Not Fire Rated: Install insulation continuously through walls and partitions.

- D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 - 1. Comply with requirements in Division 07 Section "Penetration Firestopping" and fire-resistive joint sealers.
- E. Insulation Installation at Floor Penetrations:
 - 1. Pipe: Install insulation continuously through floor penetrations.
 - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
 - 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 - 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 - 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 - 5. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 - 6. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 - 7. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 - 8. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, test connections, flow meters, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

3.6 CELLULAR-GLASS INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient services, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.

2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.7 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
 1. Install pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
 4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
 1. Install mitered sections of pipe insulation.
 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:
 1. Install preformed valve covers manufactured of same material as pipe insulation when available.
 2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 3. Install insulation to flanges as specified for flange insulation application.
 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 MINERAL-FIBER INSULATION INSTALLATION

- A. Insulation Installation on Straight Pipes and Tubes:
 1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
 4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.9 FINISHES

A. Equipment and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect field-insulated equipment, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
2. Inspect pipe, fittings, and valves, randomly selected by Commissioner, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of threaded valves, and one location of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.11 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
1. Drainage piping located in crawl spaces.
 2. Underground piping.
 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.12 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

1. NPS 1 and Smaller: Insulation shall be one of the following:
 - a. Cellular Glass: 1-1/2 inches thick.
 - b. Flexible Elastomeric: 1/2 inch thick.
 - c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.
2. NPS 1-1/4 and Larger: Insulation shall be one of the following:
 - a. Cellular Glass: 1-1/2 inches thick.
 - b. Flexible Elastomeric: 1 inch thick.
 - c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

B. Domestic Hot and Recirculated Hot Water:

1. NPS 1-1/4 and Smaller: Insulation shall be one of the following:
 - a. Cellular Glass: 1-1/2 inches thick.
 - b. Flexible Elastomeric: 1 inch thick.
 - c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

2. NPS 1-1/2 and Larger: Insulation shall be one of the following:
 - a. Cellular Glass: 1-1/2 inches thick.
 - b. Flexible Elastomeric: 1 inch thick.
 - c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

- C. Exposed in Public Areas Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:
 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Flexible Elastomeric: 1/2 inch thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

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SECTION 220800 - COMMISSIONING OF PLUMBING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 22, and other Division 01 Specification Sections, apply to this section.
- B. The OPR and BOD documentation are included for reference information only.
- C. Division 01 section "Sustainable Design Requirements (LEED Building)" for additional LEED requirements.

1.2 SUMMARY

- A. This section includes commissioning process requirements for Plumbing systems, assemblies, and equipment.
- B. Related Sections:
 - 1. Division 01 Section "General Commissioning Requirements" for general commissioning process requirements.

1.3 DESCRIPTION

- A. Commissioning: Commissioning is a systematic process of ensuring that all building systems, including the mechanical and electrical systems, have been installed in the prescribed manner, are functionally checked and capable of being operated and maintained to perform with the design intent and have documentation to support proper installation and operation. The Commissioning Agent (CxA) shall provide the City of New York with an unbiased, objective view of the system's installation, operation and performance. This process does not eliminate or reduce the responsibility of each system designer to provide a complete design or installing subcontractors to provide a finished product. Commissioning is intended to enhance the quality of each system installation, startup and transfer to beneficial use by the City of New York.
- B. Commissioning during the construction phase is intended to achieve the following specific objectives, according to the Contract Documents:
 - 1. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
 - 2. Verify and document proper performance of equipment and systems.
 - 3. Verify that Operation & Maintenance documentation is complete and transferred to City of New York.
 - 4. Verify that the City of New York's operating personnel are adequately trained.

5. Verify a contract is in place for a post occupancy review with O&M staff within 10 months after Substantial Completion.
- C. The Commissioning process shall be a team effort and encompass, as well as coordinate, the traditionally separate functions of system documentation, system installation, equipment startup, control system calibration, testing, balancing and verification and performance checkouts.
- D. The CxA will work closely with the construction team, cooperating on and coordinating all Cx activities with the CM, City of New York 's representative, Trade Contractors, subcontractors, manufacturers and equipment suppliers.
- E. The Cx process shall not reduce the responsibility of the CM to comply with the Contract Documents.

1.4 DEFINITIONS

- A. Refer to Division 01 Section "General Commissioning Requirements" for definitions.

1.5 SUBMITTALS

- A. Refer to Division 01 Section "General Commissioning Requirements" for CxA's role.
- B. Refer to Division 01 Section "General Conditions" for specific requirements. In addition, provide the following:
- C. Certificates of readiness
- D. Certificates of completion of installation, prestart, and startup activities.
- E. O&M manuals
- F. Test reports

1.6 QUALITY ASSURANCE

- A. Test Equipment Calibration Requirements: Contractors will comply with test manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxA upon request.

1.7 COORDINATION

- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to coordination during the commissioning process.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

- A. All standard testing equipment required to perform startup, initial checkout and functional performance testing shall be provided by the contractor for the equipment being tested. For example, the plumbing contractor of Division 22 shall ultimately be responsible for all standard testing equipment for the plumbing system in Division 22, except for equipment specific to and used by TAB in their commissioning responsibilities. A sufficient quantity of two-way radios shall be provided by each subcontractor.
- B. Special equipment, tools and instruments (specific to a piece of equipment and only available from vendor) required for testing shall be included in the base bid price to the City of New York and left on site, except for stand-alone data logging equipment that may be used by the CxA.
- C. Proprietary test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist in the commissioning process as needed. Proprietary test equipment (and software) shall become the property of the City of New York upon completion of the commissioning process.
- D. Data logging equipment and software required to test equipment, if provided by the CxA, shall not become the property of the City of New York.
- E. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year.

PART 3 - EXECUTION

3.1 GENERAL DOCUMENTATION REQUIREMENTS

- A. With assistance from the installing contractors, the CxA will prepare Pre-Functional Checklists for commissioned components, equipment, and systems
- B. Red-lined Drawings:
 - 1. The contractor will verify all equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawings.
 - 2. Preliminary red-lined drawings must be made available to the Commissioning Team for use prior to the start of Functional Performance Testing.
 - 3. Changes, as a result of Functional Testing, must be incorporated into the final as-built drawings, which will be created from the red-lined drawings.

4. The contracted party, as defined in the Contract Documents will create the as-built drawings.
- C. Operation and Maintenance Data:
1. Contractor will provide a copy of O&M literature within 45 days of each submittal acceptance for use during the commissioning process for all commissioned equipment and systems.
 2. The CxA will review the O&M literature once for conformance to project requirements.
 3. The CxA will receive a copy of the final approved O&M literature once corrections have been made by the contractor.
- D. Demonstration and Training:
1. Contractor will provide demonstration and training as required by the specifications.
 2. A complete training plan and schedule must be submitted by the contractor to the CxA four weeks (4) prior to any training.
 3. A training agenda for each training session must be submitted to the CxA one (1) week prior the training session.
 4. The CxA shall be notified at least 72 hours in advance of scheduled tests so that testing may be observed by the CxA and City of New York 's representative. A copy of the test record shall be provided to the CxA, City of New York, and Commissioner.
 5. Engage a Factory-authorized service representative to train City of New York 's maintenance personnel to adjust, operate, and maintain specific equipment.
 6. Train City of New York 's maintenance personnel on procedures and schedules for starting and stopping, trouble shooting, servicing, and maintaining equipment.
 7. Review data in O&M Manuals.

3.2 CONTRACTOR'S RESPONSIBILITIES

- A. Perform commissioning tests at the direction of the CxA.
- B. Attend construction phase controls coordination meetings.
- C. Attend domestic water balancing review and coordination meetings.
- D. Participate in Plumbing systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.
- E. Provide information requested by the CxA for final commissioning documentation.
- F. Include requirements for submittal data, operation and maintenance data, and training in each purchase order or sub-contract written.
- G. Prepare preliminary schedule for Plumbing system orientations and inspections, operation and maintenance manual submissions, training sessions, pipe and duct system testing, flushing and cleaning, equipment start-up, testing and balancing and task completion for City of New York . Distribute preliminary schedule to commissioning team members.
- H. Update schedule as required throughout the construction period.

- I. During the startup and initial checkout process, execute the related portions of the prefunctional checklists for all commissioned equipment.
- J. Assist the CxA in all verification and functional performance tests.
- K. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.
- L. Gather operation and maintenance literature on all equipment, and assemble in binders as required by the specifications. Submit to CxA (45) days after submittal acceptance.
- M. Coordinate with the CxA to provide (48) hour advance notice so that the witnessing of equipment and system start-up and testing can begin.
- N. Notify the CxA a minimum of (2) weeks in advance of the time for start of the balancing work. Attend the initial balancing meeting for review of the balancing procedures.
- O. Participate in, and schedule vendors and contractors to participate in the training sessions.
- P. Provide written notification to the CM/GCC and CxA that the following work has been completed in accordance with the contract documents, and that the equipment, systems, and sub-system are operating as required.
 - 1. Plumbing equipment including backflow preventers, domestic water heaters, pumps, plumbing fixtures, and all other equipment furnished under Division 22 and contract document.
 - 2. Gas piping, sanitary waste and vent piping, storm drainage piping, sump pumps and , sewage ejectors.
- Q. The equipment supplier shall document the performance of his equipment.
- R. Provide a complete set of red-lined drawings to the CxA prior to the start of Functional Performance Testing.
- S. Balance Contractor
 - 1. Attend initial commissioning coordination meeting scheduled by the CxA.
 - 2. Submit the site specific balancing plan to the CxA and Design Professional for review and acceptance.
 - 3. Attend the balancing review meeting scheduled by the CxA. Be prepared to discuss the procedures that shall be followed in balancing the Plumbing system.
 - 4. At the completion of the balancing work, and the submittal of the final balancing report, notify the Plumbing contractor and the CM/GC.
 - 5. At the completion of balancing work, and the submittal of the final balancing report, notify the Plumbing Contractor and the CM/GC.
 - 6. Participate in verification of the balancing report, which will consist of repeating measurements contained in the balancing reports. Assist in diagnostic purposes when directed.
- T. Provide training of the City of New York 's operating staff using expert qualified personnel, as specified.
- U. Equipment Suppliers

1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the City of New York , to keep warranties in force.
 2. Assist in equipment testing per agreements with contractors.
 3. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.
- V. Refer to Division 01 Section "General Commissioning Requirements" for additional contractor responsibilities.

3.3 CITY OF NEW YORK 'S RESPONSIBILITIES

- A. Refer to Division 01 Section "General Commissioning Requirements" for City of New York 's Responsibilities.

3.4 DESIGN PROFESSIONAL'S RESPONSIBILITIES

- A. Refer to Division 01 Section "General Commissioning Requirements" for Design Professional's Responsibilities.

3.5 CxA'S RESPONSIBILITIES

- A. Refer to Division 01 Section "General Commissioning Requirements" for CxA's Responsibilities.

3.6 TESTING PREPARATION

- A. Certify in writing to the CxA that Plumbing systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.
- B. Certify in writing to the CxA that Plumbing instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.
- C. Certify in writing that balancing procedures have been completed and that testing, adjusting, and balancing reports have been submitted, discrepancies corrected, and corrective work approved.
- D. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).
- E. Inspect and verify the position of each device and interlock identified on checklists.
- F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.
- G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

3.7 DOMESTIC WATER BALANCING VERIFICATION

- A. Prior to performance of Domestic Water Balancing work, provide copies of reports, sample forms, checklists, and certificates to the CxA.
- B. Notify the CxA at least ten (10) days in advance of testing and balancing Work, and provide access for the CxA to witness balancing Work.
- C. Provide technicians, instrumentation, and tools to verify testing and balancing of Plumbing systems at the direction of the CxA.
 - 1. The CxA will notify testing and balancing subcontractor ten (10) days in advance of the date of field verification. Notice will not include data points to be verified.
 - 2. The balancing subcontractor shall use the same instruments (by model and serial number) that were used when original data were collected.
 - 3. Failure of an item includes a deviation of more than 10 percent. Failure of more than 10 percent of selected items shall result in rejection of final balancing report.
 - 4. Remedy the deficiency and notify the CxA so verification of failed portions can be performed.

3.8 GENERAL TESTING REQUIREMENTS

- A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.
- B. Scope of Plumbing testing shall include entire Plumbing installation. Testing shall include measuring capacities and effectiveness of operational and control functions.
- C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.
- D. The CxA along with the Plumbing contractor, balancing subcontractor shall prepare detailed testing plans, procedures, and checklists for Plumbing systems, subsystems, and equipment.
- E. Tests will be performed using design conditions whenever possible.
- F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.
- G. The CxA may direct that set points be altered when simulating conditions is not practical.
- H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.
- I. If tests cannot be completed because of a deficiency outside the scope of the Plumbing system, document the deficiency and report it to the City of New York. After deficiencies are resolved, reschedule tests.

- J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.9 PLUMBING SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

- A. Equipment Testing and Acceptance Procedures: Testing requirements are specified in individual Division 22 sections. Provide submittals, test data, inspector record, and certifications to the CxA.
- B. Plumbing Instrumentation and Control System Testing: Field testing plans and testing requirements are specified in Division 22. Assist the CxA with preparation of testing plans.
- C. Pipe system cleaning, flushing, hydrostatic tests, and chemical treatment: Test requirements are specified in Division 22 piping Sections. Plumbing Contractor shall prepare a pipe system cleaning, flushing, and hydrostatic testing plan. Provide cleaning, flushing, testing, and treating plan and final reports to the CxA.
- D. Plumbing Distribution System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of air, fuel gas, sanitary waste and vent piping, storm drainage piping, sprinkler and domestic water distribution systems.
- E. Vibration and Sound Tests: Provide technicians, instrumentation, tools, and equipment to test performance of vibration isolation and seismic controls.
- F. The work included in the commissioning process involves a complete and thorough evaluation of the operation and performance of all components, systems and sub-systems. The systems shall be evaluated shall include, but not limited to:
 - 1. Domestic Hot Water System
 - 2. Fuel Gas System for Boilers and DHWH
 - 3. Hot Water Circulating Pump

3.10 DEFICIENCIES/NON-CONFORMANCE, COST OF RETESTING, FAILURE DUE TO MANUFACTURER DEFECT

- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to deficiencies/non-conformance, cost of retesting, or failure due to manufacturer defect.

3.11 APPROVAL

- A. Refer to Division 01 Section "General Commissioning Requirements" for approval procedures.

3.12 DEFERRED TESTING

- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to deferred testing.

3.13 OPERATION AND MAINTENANCE MANUALS

- A. The Operation and Maintenance Manuals shall conform to Contract Documents requirements as stated in Division 01.
- B. Refer to Division 01 Section "General Commissioning Requirements" for the AE and CxA roles in the Operation and Maintenance Manual contribution, review and approval process.

3.14 TRAINING OF CITY OF NEW YORK PERSONNEL

- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to training.
- B. Plumbing Contractor. The mechanical contractor shall have the following training responsibilities:
 - 1. Provide the CxA with a training plan two weeks before the planned training.
 - 2. Provide designated City of New York personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of Plumbing equipment.
 - 3. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
 - 4. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment is required. More than one party may be required to execute the training.
 - 5. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
 - 6. Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and preventative maintenance for all pieces of equipment.
 - 7. The plumbing contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls.
 - 8. Training shall occur after functional testing is complete, unless approved otherwise by the City of New York .

END OF SECTION 220800

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SECTION 22 11 16 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:

- 1. Water meters.
- 2. Escutcheons.
- 3. Sleeves and sleeve seals.

- B. Related sections include the following:

- 1. Division 22 Section "Domestic Water Piping Specialties."

1.3 SUBMITTALS

- A. Product Data: For the following products:

- 1. Dielectric fittings.
- 2. Water meters.
- 3. Escutcheons.
- 4. Sleeves and sleeve seals.

- B. LEED Submittal:

- 1. Product Data for Credit EQ 4.1: For solvent cements and adhesive primers, including printed statement of VOC content.

- C. Water Samples: Specified in "Cleaning" Article.

- D. Coordination Drawings: For piping in equipment rooms and other congested areas, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

- 1. Fire-suppression-water piping.
- 2. Domestic water piping.
- 3. Waste and storm water piping.
- 4. HVAC ductwork.
- 5. HVAC piping.

- E. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

- B. Comply with NSF 61 for potable domestic water piping and components.

1.5 PROJECT CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by City of New York or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
1. Notify Construction Manager no fewer than 5 days in advance of proposed interruption of water service.
 2. Do not proceed with interruption of water service without Construction Manager's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 PIPING AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.
2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
3. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
4. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- 1) Elkhart Products Corporation; Industrial Division.
- 2) NIBCO INC.

- b. NPS 2 and Smaller: Wrought-copper fitting with brazed joint.

- c. NPS 2-1/2 to NPS 3: Cast-bronze or wrought-copper fitting with brazed joint.

5. Grooved-Joint Copper-Tube Appurtenances:

- a. Manufacturers: Subject to compliance with requirements, , provide products by one of the following manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- 1) Anvil International.
- 2) Victaulic Company.

- b. Copper Grooved-End Fittings: ASTM B 75 copper tube or ASTM B 584 bronze castings.

- c. Grooved-End-Tube Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections, EPDM-rubber gaskets suitable for hot and cold water, and bolts and nuts.

B. Stainless Steel Pipe: ASTM A312 or ASTM A 778, Type 304/304L or 316/316L.

1. Pipe sizes : NPS 2-1/2 to NPS 3
2. Grooved End Fittings: Fittings shall be manufactured of stainless steel conforming to ASTM A-403, WPW, WPW/S9, or CR/S9, or shall be fabricated from stainless steel pipe conforming to ASTM A312, with factory grooved ends. Fittings shall be type 304/304L or 316/316L stainless steel.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Anvil International.
 - 2) Victaulic Company.
3. Mechanical Couplings for Joining Stainless Steel Pipe:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Anvil International.
 - 2) Victaulic Company.
 - b. Stainless Steel Mechanical Couplings: Manufactured in two or more segments of cast stainless steel, conforming to ASTM A-351, A-743, and A-744. Gaskets shall be pressure-responsive synthetic rubber, grade to suit the intended service, conforming to ASTM D-2000. Gaskets used on potable water systems shall be UL classified in accordance with ANSI/NSF-61 for potable water service. Mechanical coupling bolts shall be stainless steel, type 316, meeting the physical properties of ASTM A-193, grade B8M, Class2.
 - 1) Rigid Type: Cast with key designed to clamp the bottom of the groove to provide an essentially rigid joint. Similar to Victaulic Series 489.
 - 2) Flexible Type: Use in locations where vibration attenuation and stress relief are required. Similar to Victaulic Series 77S.
 - c. Flange Adapters: For use with grooved end pipe and fittings, for mating to ANSI Class 125 flanged components. Victaulic Style 441.
4. Joints between stainless steel and different piping materials shall be made with a mechanical joint of compression or mechanical sealing type or a dielectric fitting.

2.3 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. EPCO Sales, Inc.
 - d. Hart Industries International, Inc.
 - e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - f. Zurn Plumbing Products Group; Wilkins Water Control Products.
2. Description:
 - a. Pressure Rating: 150 psig at 180 deg F.
 - b. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. EPCO Sales, Inc.
 - d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
 - a. Factory-fabricated, bolted, companion-flange assembly.
 - b. Pressure Rating: 150 psig minimum.
 - c. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Central Plastics Company.
 - d. Pipeline Seal and Insulator, Inc.
2. Description:
 - a. Nonconducting materials for field assembly of companion flanges.
 - b. Pressure Rating: 150 psig.
 - c. Gasket: Neoprene or phenolic.
 - d. Bolt Sleeves: Phenolic or polyethylene.
 - e. Washers: Phenolic with steel backing washers.

E. Dielectric Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Calpico, Inc.
 - b. Lochinvar Corporation.
2. Description:
 - a. Galvanized-steel coupling.
 - b. Pressure Rating: 300 psig at 225 deg F.
 - c. End Connections: Female threaded.
 - d. Lining: Inert and noncorrosive, thermoplastic.

F. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Perfection Corporation; a subsidiary of American Meter Company.
 - b. Precision Plumbing Products, Inc.
 - c. Victaulic Company.
2. Description:
 - a. Electroplated steel nipple complying with ASTM F 1545.
 - b. Pressure Rating: 300 psig at 225 deg F.
 - c. End Connections: Male threaded or grooved.
 - d. Lining: Inert and noncorrosive, propylene.

2.4 ESCUTCHEONS

- A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.
1. One Piece, Cast Brass: Polished, chrome-plated finish with setscrews.
 2. Split-Casting Floor Plates: Cast brass with concealed hinge.

2.5 SLEEVES

- A. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc-coated, with plain ends.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install shutoff valve immediately upstream of each dielectric fitting.
- D. Install domestic water piping level and plumb.
- E. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- F. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- G. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- H. Install piping adjacent to equipment and specialties to allow service and maintenance.
- I. Install piping to permit valve servicing.
- J. Install nipples, unions, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.
- K. Install piping free of sags and bends.
- L. Install fittings for changes in direction and branch connections.
- M. Install unions in copper tubing at final connection to each piece of equipment, and specialty.
- N. Install thermostats in hot-water circulation piping.

3.2 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID.
- D. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Braze Joints" Chapter.

- E. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- F. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.3 VALVE INSTALLATION

- A. General-Duty Valves: Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for valve installations.
- B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.
- C. Install drain valves at base of each water riser, at low points in horizontal piping, and where required to drain water piping. Drain valves are specified in Division 22 Section "Domestic Water Piping Specialties."
- D. Hose-End Drain Valves: At low points in water mains, risers, and branches.
- E. Stop-and-Waste Drain Valves: Instead of hose-end drain valves where indicated.
- F. Install calibrated balancing valves in each hot-water circulation return branch and discharge side of each pump and circulator. Set calibrated balancing valves partly open to restrict but not stop flow. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for calibrated balancing valves.

3.4 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples.
- C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric nipples.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support products and installation.
- B. Vertical Piping: MSS Type 8 or 42, clamps.
- C. Individual, Straight, Horizontal Piping Runs:
 - 1. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

- F. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 4. NPS 2-1/2: 108 inches with 1/2-inch rod.
 5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
 6. Install supports for vertical copper tubing every 10 feet.

3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Connect domestic water piping to existing water-supply piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Comply with requirements in Division 22 plumbing fixture Sections for connection sizes.
 3. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.7 ESCUTCHEON INSTALLATION

- A. Install escutcheons for penetrations of walls, ceilings, and floors.
- B. Escutcheons for New Piping:
1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
 2. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
 3. Bare Piping at Ceiling Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
 4. Bare Piping in Unfinished Service Spaces: One piece, cast brass with rough-brass finish.
 5. Bare Piping in Equipment Rooms: One piece, cast brass.
 6. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece floor plate.

3.8 SLEEVE INSTALLATION

- A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.
- B. Sleeves are not required for core-drilled holes.
- C. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.

- D. Install sleeves in new partitions, slabs, and walls as they are built.
- E. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants" for joint sealants.
- F. Seal space outside of sleeves in concrete slabs and walls with fire rated elastomeric sealant.
- G. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.
- H. Install sleeve materials according to the following applications:
 - 1. Sleeves for Piping Passing through Concrete Floor Slabs: Steel pipe.
 - 2. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical Equipment Areas or Other Wet Areas: Steel pipe.
 - a. Extend sleeves 2 inches above finished floor level.
 - b. For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim" for flashing.
 - 3. Sleeves for Piping Passing through Gypsum-Board Partitions:
 - a. Steel pipe sleeves for pipes smaller than NPS 6.
 - b. Exception: Sleeves are not required for water supply tubes and waste pipes for individual plumbing fixtures if escutcheons will cover openings.
 - 4. Sleeves for Piping Passing through Interior Concrete Walls:
 - a. Steel pipe sleeves for pipes smaller than NPS 6.
- I. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestop materials and installations.

3.9 IDENTIFICATION

- A. Identify system components. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for identification materials and installation.
- B. Label pressure piping with system operating pressure.

3.10 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Piping Inspections:
 - 1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.

2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- C. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
- D. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- E. Piping Tests:
 1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
 2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
 3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
- F. Prepare reports for tests and for corrective action required.
- G. Domestic water piping will be considered defective if it does not pass tests and inspections.
- H. Prepare test and inspection reports.

3.11 ADJUSTING

- A. Perform the following adjustments before operation:
 1. Close drain valves, and hose bibbs.
 2. Open shutoff valves to fully open position.
 3. Open throttling valves to proper setting.
 4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
 - b. Adjust calibrated balancing valves to flows indicated.
 5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
 6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
 7. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.12 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
3. Prepare and submit reports of purging and disinfecting activities.
4. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.13 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Aboveground domestic water piping, NPS 2 1/2 and smaller shall be the following:
- D. Hard copper tube, ASTM B 88, Type L cast- or wrought-copper solder-joint fittings; and brazed joints.

3.14 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 1. Shutoff Duty: Use ball or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves with flanged ends for piping NPS 2-1/2 and larger.
 2. Throttling Duty: Use ball or globe valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
 3. Hot-Water Circulation Piping, Balancing Duty: Calibrated balancing valves.
 4. Drain Duty: Hose-end drain valves.
 5. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION 22 11 16

SECTION 22 11 19 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following domestic water piping specialties:

1. Vacuum breakers.
2. Backflow preventers.
3. Balancing valves.
4. Temperature-actuated water mixing valves.
5. Hose bibbs.
6. Drain valves.
7. Water hammer arresters.

- B. Related Sections include the following:

1. Division 22 Section "Domestic Water Piping" for water meters.

1.3 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. NSF Compliance:
 1. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9".

PART 2 - - PRODUCTS

2.1 VACUUM BREAKERS

A. Hose-Connection Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Arrowhead Brass Products, Inc.
 - b. Cash Acme.
 - c. Conbraco Industries, Inc.
 - d. Legend Valve.
 - e. MIFAB, Inc.
 - f. Watts Industries, Inc.; Water Products Div.
 - g. Woodford Manufacturing Company.
 - h. Zurn Plumbing Products Group; Wilkins Div.
2. Standard: ASSE 1011.
3. Body: Bronze, nonremovable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Chrome or nickel plated.

2.2 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ames Co.
 - b. Conbraco Industries, Inc.
 - c. FEBCO; SPX Valves & Controls.
 - d. Watts Industries, Inc.; Water Products Div.
 - e. Zurn Plumbing Products Group; Wilkins Div.
2. Standards: ASSE 1013, NYC DEP
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 10 psig maximum, through middle 1/3 of flow range.
5. Pressure Loss at Design Flow Rate: 5 for sizes NPS 2 and smaller; 8 psig for NPS 2-1/2 and larger.
6. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
7. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
8. Model: Similar to Watts 909 series.
9. Accessories:
 - a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2-1/2 and larger.
 - b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

B. Double-Check Backflow-Prevention Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ames Co.
 - b. Conbraco Industries, Inc.
 - c. FEBCO; SPX Valves & Controls.
 - d. Flomatic Corporation.
 - e. Watts Industries, Inc.; Water Products Div.
 - f. Zurn Plumbing Products Group; Wilkins Div.
2. Standard: ASSE 1015.
3. Operation: Continuous-pressure applications, unless otherwise indicated.
4. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
5. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
7. Configuration: Designed for horizontal, straight through flow.
8. Accessories:
 - a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2-1/2 and larger.

2.3 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong International, Inc.
 - b. Flo Fab Inc.
 - c. ITT Industries; Bell & Gossett Div.
 - d. NIBCO INC.
 - e. TAC Americas.
 - f. Taco, Inc.
 - g. Watts Industries, Inc.; Water Products Div.
2. Type: Ball valve with two readout ports and memory setting indicator.
3. Body: Brass or bronze,
4. Size: Same as connected piping, but not larger than NPS 2.
5. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

2.4 TEMPERATURE-ACTUATED WATER MIXING VALVES

A. Individual-Fixture, Water Tempering Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cash Acme.
 - b. Conbraco Industries, Inc.
 - c. Honeywell Water Controls.
 - d. Lawler Manufacturing Company, Inc.
 - e. Leonard Valve Company.
 - f. Powers; a Watts Industries Co.
 - g. Watts Industries, Inc.; Water Products Div.
 - h. Zurn Plumbing Products Group; Wilkins Div.
2. Standard: ASSE 1016, thermostatically controlled water tempering valve.
3. Pressure Rating: 125 psig minimum, unless otherwise indicated.
4. Body: Bronze body with corrosion-resistant interior components.
5. Temperature Control: Adjustable.
6. Inlets and Outlet: Threaded.
7. Finish: Rough or chrome-plated bronze.
8. Tempered-Water Setting: 110 deg F.

2.5 HOSE BIBBS

A. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Chrome or nickel plated.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle.
12. Operation for Service Areas: Operating key.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.
15. Include wall flange with each chrome- or nickel-plated hose bibb.

2.6 WALL HYDRANTS

A. Non-freeze Wall Hydrants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Josam Company.
 - b. MIFAB, Inc.
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.

- d. Tyler Pipe; Wade Div.
 - e. Watts Drainage Products Inc.
 - f. Woodford Manufacturing Company.
 - g. Zurn Plumbing Products Group; Light Commercial Operation.
 - h. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.21.3M for concealed and exposed-outlet, self-draining wall hydrants.
 3. Pressure Rating: 125 psig.
 4. Operation: Loose key.
 5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
 6. Inlet: NPS 3/4 or NPS 1.
 7. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
 8. Box: Deep, flush mounting with cover.
 9. Box and Cover Finish: Polished nickel bronze.
 10. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
 11. Nozzle and Wall-Plate Finish: Polished nickel bronze.
 12. Operating Keys(s): Two with each wall hydrant.
 13. Model: Similar to J.R.Smith # 5509QT

2.7 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.8 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AMTROL, Inc.
 - b. Josam Company.
 - c. MIFAB, Inc.
 - d. PPP Inc.
 - e. Sioux Chief Manufacturing Company, Inc.
 - f. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - g. Tyler Pipe; Wade Div.
 - h. Watts Drainage Products Inc.
 - i. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Metal bellows.
4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F

2.9 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers :

1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
5. Perforation Size:
 - a. Strainers NPS 2 and Smaller: 0.020 inch.
 - b. Strainers NPS 2-1/2 to NPS 4: 0.045 inch.
6. Drain: Factory-installed, hose-end drain valve.

2.10 AUTOMATIC TRAP PRIMER VALVES

A. Supply-Type, Trap-Seal Primer Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. MIFAB, Inc.
 - b. PPP Inc.
 - c. Sioux Chief Manufacturing Company, Inc.
 - d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - e. Watts Industries, Inc.; Water Products Div.
2. Standard: ASSE 1018.
3. Pressure Rating: 30-250 psig
4. Body: Brass-plated Zamac #3
5. Finish: Non-corrosive brass.
6. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
7. Model: Similar to PPP Inc. PT- # of drains served.
8. Installation: Vertical position
9. Water release: Factory set

PART 3 - - EXECUTION

3.1 INSTALLATION

- A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.
- B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
 1. Locate backflow preventers in same room as connected equipment or system.

2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
 3. Do not install bypass piping around backflow preventers.
- C. Install balancing valves in locations where they can easily be adjusted.
- D. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
1. Install thermometers and water regulators if specified.
- E. Install water hammer arresters in water piping according to PDI-WH 201.
- F. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.
- B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- C. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
1. Reduced-pressure-principle backflow preventers.
 2. Calibrated balancing valves.
 3. Primary water tempering valves.
 4. Hose stations.
 5. Supply-type, trap-seal primer valves.
- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and prepare test reports:
1. Test each reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.
- B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.5 ADJUSTING

- A. Set field-adjustable flow set points of balancing valves.
- B. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION 22 11 19

SECTION 22 13 16 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following for soil, waste, and vent piping inside the building:
 - 1. Pipe, tube, and fittings.
- B. Related Sections include the following:
 - 1. Division 22 Section "Sanitary Waste Piping Specialties"

1.3 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water.

1.4 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. LEED Submittal
 - 1. Product Data for Credit EQ 4.1: For solvent cements and adhesive primers, including printed statement of VOC content.
- C. Shop Drawings
- D. Field quality-control inspection and test reports.

1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.
 - 1. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.
 - a. Manufacturers:
 - 1) ANACO.
 - 2) Clamp-All Corp.
 - 3) Ideal Div.; Stant Corp.
 - 4) Mission Rubber Co.
 - 5) Tyler Pipe; Soil Pipe Div.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.
- B. Aboveground, soil and waste piping NPS 6 and smaller shall be any of the following:
 - 1. Hubless cast-iron soil pipe and fittings heavy-duty shielded, stainless-steel couplings; and hubless-coupling joints.
 - 2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.
- C. Aboveground, vent piping NPS 4 and smaller shall be any of the following:
 - 1. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel and rigid couplings; and hubless-coupling joints.
 - 2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.

3.2 PIPING INSTALLATION

- A. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

- B. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
 - 1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
 - 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
 - 3. Vent Piping: 0.5 percent down toward vertical fixture vent or toward vent stack.
- C. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.3 JOINT CONSTRUCTION

- A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."
- B. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

3.4 HANGER AND SUPPORT INSTALLATION

- A. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:
 - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 2. Install individual, straight, horizontal piping runs according to the following:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
- B. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.
- E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
 - 2. NPS 3: 60 inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
 - 4. NPS 6: 60 inches with 3/4-inch rod.
- F. Install supports for vertical cast-iron soil piping every 15 feet.
- G. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/4: 84 inches with 3/8-inch rod.
 - 2. NPS 1-1/2: 108 inches with 3/8-inch rod.
 - 3. NPS 2: 10 feet with 3/8-inch rod.
 - 4. NPS 2-1/2: 11 feet with 1/2-inch rod.
 - 5. NPS 3: 12 feet with 1/2-inch rod.

- H. Install supports for vertical steel piping every 15 feet.
- I. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.5 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to existing sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
 - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
 - 2. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
 - 3. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

3.6 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
 - 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping

system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.7 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 22 13 16

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SECTION 22 13 19 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following sanitary drainage piping specialties:
 - 1. Cleanouts.
 - 2. Floor drains.
 - 3. Miscellaneous sanitary drainage piping specialties.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories.
- B. Shop Drawings:
- C. Field quality-control test reports.

1.4 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - - PRODUCTS

2.1 CLEANOUTS

- A. Exposed Metal Cleanouts
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Josam Company; Josam Div.
 - b. MIFAB, Inc.
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - d. Tyler Pipe; Wade Div.
 - e. Watts Drainage Products Inc.
 - f. Zurn Plumbing Products Group; Specification Drainage Operation.
 - g. Josam Company; Blucher-Josam Div.
 - 2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
 - 3. Size: Same as connected drainage piping
 - 4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
 - 5. Closure: Countersunk, brass plug.

6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Josam Company; Josam Div.
 - b. MIFAB, Inc.
 - c. Prier Products, Inc.
 - d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - e. Tyler Pipe; Wade Div.
 - f. Watts Drainage Products Inc.
 - g. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.6.3
3. Pattern: Floor Sanitary.
4. Body Material: Gray iron.
5. Seepage Flange: Required.
6. Anchor Flange: Required.
7. Clamping Device: Required.
8. Outlet: Bottom.
9. Backwater Valve: Not required.
10. Coating on Interior and Exposed Exterior Surfaces: Acid-resistant enamel.
11. Sediment Bucket: As indicated on drawing on floor drain schedule on drawing P-001.
12. Top or Strainer Material: Gray iron.
13. Top of Body and Strainer Finish: As indicated on drawing on floor drain schedule on drawing P-001.
14. Top Shape: As indicated on drawing on floor drain schedule on drawing P-001.
15. Dimensions of Top or Strainer: Varies.
16. Top Loading Classification: As indicated on drawing on floor drain schedule on drawing P-001.
17. Funnel: Not required.
18. Trap Material: Cast iron.
19. Trap Pattern: Deep-seal P-trap

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.
- B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 2. Locate at each change in direction of piping greater than 45 degrees.
 3. Locate at minimum intervals of 50 feet
 4. Locate at base of each vertical soil and waste stack.

- C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
 - 1. Position floor drains for easy access and maintenance.
 - 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
 - a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
 - b. Radius, 30 to 60 Inches Equivalent to 1 percent slope.
 - c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.
 - 3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
 - 4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- E. Install deep-seal traps on floor drains and other waste outlets.
- F. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
- G. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.
- H. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.
- I. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

3.4 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 22 13 19

SECTION 22 33 00 - ELECTRIC DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following electric water heaters:

1. Flow-control, instantaneous electric water heaters.
2. Commercial, storage electric water heaters.
3. Water heater accessories.

1.3 SUBMITTALS

- A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. LEED Submittal:
 1. Product Data for Prerequisite EA 2: Documentation indicating that units comply with ASHRAE/IESNA 90.1-2004, Section 7 - "Service Water Heating."
- C. Shop Drawings: Diagram power, signal, and control wiring.
- D. Product Certificates: For each type of commercial and instantaneous electric water heater, signed by product manufacturer.
- E. Manufacturer Seismic Qualification Certification: Submit certification that commercial water heaters, accessories, and components will withstand seismic forces defined in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment." Include the following:
 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- F. Source quality-control test reports.
- G. Field quality-control test reports.

- H. Operation and Maintenance Data: For electric water heaters to include in emergency, operation, and maintenance manuals.
 - I. Warranty: Special warranty specified in this Section.
- 1.4 QUALITY ASSURANCE
- A. Source Limitations: Obtain same type of electric water heaters through one source from a single manufacturer.
 - B. Product Options: Drawings indicate size, profiles, and dimensional requirements of electric water heaters and are based on the specific system indicated.
 - C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 - D. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004.
 - E. ASME Compliance: Where indicated, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
 - F. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for all components that will be in contact with potable water.
- 1.5 COORDINATION
- A. Coordinate size and location of concrete bases with Architectural and Structural Drawings.
- 1.6 WARRANTY
- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric water heaters that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including storage tank and supports.
 - b. Faulty operation of controls.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
 - 2. Warranty Period(s): From date of Substantial Completion:
 - a. Instantaneous Electric Water Heaters: Five years.
 - b. Commercial Electric Water Heaters:
 - 1) Storage Tank: Three years.
 - 2) Controls and Other Components: One year.

PART 2 - PRODUCTS

2.1 REFER TO EQUIPMENT SCHEDULE ON THE CONTRACT DRAWINGS FOR ADDITIONAL INFORMATION.

2.2 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.3 INSTANTANEOUS ELECTRIC WATER HEATERS

A. Flow-Control, Instantaneous Electric Water Heaters: Comply with UL 499 for tankless electric (water heater) heating appliance.

1. Manufacturers:

- a. Chronomite Laboratories, Inc.
- b. Controlled Energy Corporation.
- c. Eemax, Inc.
- d. Hot Aqua, Inc.

2. Construction: Copper piping or tubing complying with NSF 61 barrier materials for potable water, without storage capacity.

- a. Connections: ASME B1.20.1 pipe thread.
- b. Pressure Rating: 150 psig.
- c. Heating Element: Resistance heating system.
- d. Temperature Control: Flow-control fitting.
- e. Safety Control: High-temperature-limit cutoff device or system.
- f. Jacket: Aluminum or steel with enameled finish or plastic.

3. Support: Bracket for wall mounting.

2.4 COMMERCIAL ELECTRIC WATER HEATERS

A. Commercial, Storage Electric Water Heaters: Comply with UL 1453 requirements for storage-tank-type water heaters.

1. Manufacturers:

- a. Bock Water Heaters, Inc.
- b. Electric Heater Company (The); Hubbell Heaters Division.
- c. Lochinvar Corporation.
- d. PVI Industries, LLC.
- e. Rheem Water Heater Div.; Rheem Manufacturing Company.
- f. Ruud Water Heater Div.; Rheem Manufacturing Company.
- g. Smith, A. O. Water Products Company.
- h. State Industries, Inc.

2. Storage-Tank Construction: Steel vertical arrangement.
 - a. Tappings: Factory fabricated of materials compatible with tank and piping connections. Attach tappings to tank before testing.
 - 1) NPS 2 and Smaller: Threaded ends according to ASME B1.20.1.
 - 2) NPS 2-1/2 and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges, and according to ASME B16.24 for copper and copper-alloy flanges.
 - b. Pressure Rating: 150 psig.
 - c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.
3. Factory-Installed Storage-Tank Appurtenances:
 - a. Anode Rod: Replaceable magnesium.
 - b. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
 - c. Insulation: Comply with ASHRAE/IESNA 90.1.
 - d. Jacket: Steel with enameled finish.
 - e. Heating Elements: Electric, screw-in or bolt-on immersion type arranged in multiples of three.
 - 1) Staging: Input not exceeding 18 kW per step.
 - f. Temperature Control: Adjustable thermostat.
 - g. Safety Controls: High-temperature-limit and low-water cutoff devices or systems.
 - h. Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3, for combination temperature and pressure relief valves. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.
4. Special Requirements: NSF 5 construction.
5. Building Automation System Interface: Normally closed dry contacts for enabling and disabling water heater.

2.5 WATER HEATER ACCESSORIES

- A. Combination Temperature and Pressure Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.
- B. Pressure Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3. Include pressure setting less than water heater working-pressure rating.
- C. Water Heater Stand and Drain-Pan Units: High-density-polyethylene-plastic, 18-inch high, enclosed-base stand complying with IAPMO PS 103 and IAS No. 2. Include integral or separate drain pan with raised edge and NPS 1 drain outlet with ASME B1.20.1 pipe thread.
- D. Water Heater Stands: Water heater manufacturer's factory-fabricated steel stand for floor mounting and capable of supporting water heater and water. Include dimension that will support bottom of water heater a minimum of 18 inches above the floor.

- E. Water Heater Mounting Brackets: Water heater manufacturer's factory-fabricated steel bracket for wall mounting and capable of supporting water heater and water.
 - F. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of water heater and include drain outlet not less than NPS 3/4.
 - G. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1-2004
 - H. Water Regulators: ASSE 1003, water-pressure reducing valve. Set at 25-psig maximum outlet pressure, unless otherwise indicated.
 - I. Shock Absorbers: ASSE 1010 or PDI WH 201, Size A water hammer arrester.
- 2.6 SOURCE QUALITY CONTROL
- A. Test and inspect water heater storage tanks, specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.
 - B. Hydrostatically test commercial water heater storage tanks before shipment to minimum of one and one-half times pressure rating.
 - C. Prepare test reports.

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

- A. Install commercial water heaters on concrete bases.
 - 1. Exception: Omit concrete bases for commercial water heaters if installation on stand, bracket, suspended platform, or direct on floor is indicated.
 - 2. Concrete base construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."
- B. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
- C. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- D. Install combination temperature and pressure relief valves in water piping for water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

- E. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to Division 22 Section "Domestic Water Piping Specialties" for hose-end drain valves.
- F. Install thermometer on outlet piping of water heaters. Refer to Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers.
- G. Install pressure gage(s) on inlet and outlet of commercial electric water- heater piping. Refer to Division 22 Section "Meters and Gages for Plumbing Piping" for pressure gages.
- H. Assemble and install inlet and outlet piping manifold kits for multiple water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each water heater. Include shutoff valve, thermometer in each water heater inlet and outlet, and throttling valve in each water heater outlet. Refer to Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers.
- I. Install water regulator, with integral bypass relief valve, in booster-heater inlet piping and water hammer arrester in booster-heater outlet piping.
- J. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.
- K. Fill water heaters with water.
- L. Charge compression tanks with air.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
 - 1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

- C. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial and instantaneous electric water heaters

END OF SECTION 22 33 00

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SECTION 22 40 00 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following conventional plumbing fixtures and related components:

1. Faucets for lavatories and sinks.
2. Laminar-flow faucet-spout outlets.
3. Flushometers.
4. Toilet seats.
5. Protective shielding guards.
6. Fixture supports.
7. Water closets.
8. Urinals.
9. Lavatories.
10. Service basins.
11. Owner-furnished fixtures.

- B. Related Sections include the following:

1. Division 10 Section "Toilet, Bath, and Laundry Accessories."
2. Division 22 Section "Domestic Water Piping Specialties" for backflow preventers, floor drains, and specialty fixtures not included in this Section.

1.3 DEFINITIONS

- A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.
- B. Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.
- C. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

1.4 SUBMITTALS

- A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.
- B. LEED Submittal:
 1. Product Data for Credit WE 2, 3.1, and 3.2: Documentation indicating flow and water consumption requirements.

- C. Shop Drawings: Diagram power, signal, and control wiring.
- D. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.
 - 1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.
- D. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- E. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- F. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.
- G. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
 - 1. Plastic Mop-Service Basins: ANSI Z124.6.
 - 2. Solid-Surface-Material Lavatories and Sinks: ANSI/ICPA SS-1.
 - 3. Vitreous-China Fixtures: ASME A112.19.2M.
 - 4. Water-Closet, Flush Valve, ASME A112.19.5.
- H. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:
 - 1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
 - 2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
 - 3. Faucets: ASME A112.18.1.
 - 4. Hose-Connection Vacuum Breakers: ASSE 1011.
 - 5. Hose-Coupling Threads: ASME B1.20.7.
 - 6. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
 - 7. NSF Potable-Water Materials: NSF 61.
 - 8. Pipe Threads: ASME B1.20.1.
 - 9. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
 - 10. Supply Fittings: ASME A112.18.1.
 - 11. Brass Waste Fittings: ASME A112.18.2.

- I. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:
 1. Atmospheric Vacuum Breakers: ASSE 1001.
 2. Brass and Copper Supplies: ASME A112.18.1.
 3. Brass Waste Fittings: ASME A112.18.2.
 4. Sensor-Operation Flushometers: ASSE 1037 and UL 1951.

 - J. Comply with the following applicable standards and other requirements specified for miscellaneous components:
 1. Floor Drains: ASME A112.6.3.
 2. Hose-Coupling Threads: ASME B1.20.7.
 3. Off-Floor Fixture Supports: ASME A112.6.1M.
 4. Pipe Threads: ASME B1.20.1.
 5. Plastic Toilet Seats: ANSI Z124.5.
 6. Supply and Drain Protective Shielding Guards: ICC A117.1.
- 1.6 EXTRA MATERIALS
- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.
 2. Flushometer Valve, Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than 12 of each type.
 3. Provide hinged-top wood or metal box, or individual metal boxes, with separate compartments for each type and size of extra materials listed above.
 4. Toilet Seats: Equal to 1 of each type installed.

PART 2 - PRODUCTS

2.1 LAVATORY FAUCETS

A. Lavatory Faucets:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. American Standard Companies, Inc.
 - b. Chicago Faucets.
 - c. Delta Faucet Company.
 - d. Kohler Co.
 - e. Moen, Inc.
 - f. Speakman Company.
 - g. Zum Plumbing Products Group; Commercial Brass Operation.

2. Description:

- a. Body Material: Commercial, solid brass, brass underbody with brass cover plate.
- b. Finish: Polished chrome plate.
- c. Maximum Flow Rate: 0.35 gpm.
- d. Mounting: Deck, exposed .
- e. Inlet(s): NPS 1/2 male shank.
- f. Spout Outlet: Aerator.
- g. Operation: Sensor Self-closing, metering.
- h. Drain: Grid.
- i. Tempering Device: Thermostatic Pressure balance.
- j. Electric requirements: 6 VDC Adaptor Powered.

2.2 SINK FAUCETS

A. Mop Sink and Service Sink Faucets:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Zurn Plumbing Products Group; Commercial Brass Operation.
 - b. Chicago Faucets.
 - c. Delta Faucet Company.
 - d. Elkay Manufacturing Co.
 - e. Just Manufacturing Company.
 - f. Speakman Company.

2. Description:

- a. Accessory: wall hook.

2.3 FLUSHOMETERS

A. Flushometers:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Coyne & Delany Co.
 - b. Delta Faucet Company.
 - c. Sloan Valve Company.
 - d. Zurn Plumbing Products Group; Commercial Brass Operation.
 - e. Sloan Valve Company.
 - f. TOTO USA, Inc.

2. Description:

- a. Internal Design: Synthetic rubber diaphragm with dual filtered fixed bypass.
- b. Style: Exposed.
- c. Inlet Size: NPS 1.
- d. Trip Mechanism: Infrared sensor and override button.
- e. Consumption: 1.28 gal./flush

3. Description:
 - a. Internal Design: Synthetic rubber seals.
 - b. Style: Exposed.
 - c. Inlet Size: NPS 3/4.
 - d. Trip Mechanism: Infrared sensor and override button.
 - e. Consumption: 0.13 gal. /flush.

2.4 TOILET SEATS

A. Toilet Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Standard Companies, Inc.
 - b. Bemis Manufacturing Company.
 - c. Centoco Manufacturing Corp.
 - d. Church Seats.
 - e. Eljer.
 - f. Kohler Co.
 - g. Olsonite Corp.
2. Description: Toilet seat shall be extra heavy weight and injection molded of solid plastic. Seats shall be open front less cover for elongated bowl and feature large molded-in bumpers. Seats shall have external check hinges with 300 Series stainless steel posts and pintles that stop seat 11 degrees beyond vertical. Similar to Olsonite Corp. Model 10CT.
 - a. Material: Molded, solid plastic with antimicrobial agent.
 - b. Configuration: Open front with without cover.
 - c. Size: Elongated Regular.
 - d. Hinge Type: SS, self-sustaining.
 - e. Class: Heavy-duty commercial.
 - f. Color: White.

2.5 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Engineered Brass Co.
 - b. Insul-Tect Products Co.; a Subsidiary of MVG Molded Products.
 - c. McGuire Manufacturing Co., Inc.
 - d. Plumberex Specialty Products Inc.
 - e. TCI Products.
 - f. TRUEBRO, Inc.
 - g. Zurn Plumbing Products Group; Tubular Brass Plumbing Products Operation.

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. TRUEBRO, Inc.
2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

2.6 FIXTURE SUPPORTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Josam Company.
2. MIFAB Manufacturing Inc.
3. Smith, Jay R. Mfg. Co.
4. Tyler Pipe; Wade Div.
5. Watts Drainage Products Inc.; a div. of Watts Industries, Inc.
6. Zurn Plumbing Products Group; Specification Drainage Operation.

B. Water-Closet Supports:

1. Description: Combination carrier designed for accessible standard mounting height of wall-mounting, water-closet-type fixture. Include single or double, vertical or horizontal, hub-and-spigot or hubless waste fitting as required for piping arrangement; faceplates; couplings with gaskets; feet; and fixture bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.

C. Urinal Supports:

1. Description: Type I, urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture. Include steel uprights with feet.
2. Accessible-Fixture Support: Include rectangular steel uprights.

D. Lavatory Supports:

1. Description: Type III, lavatory carrier with hanger plate and tie rod for wall-mounting, lavatory-type fixture. Include steel uprights with feet.
2. Accessible-Fixture Support: Include rectangular steel uprights.

2.7 WATER CLOSETS

A. Water Closets:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Zurn Plumbing Fixtures.

- b. American Standard Companies, Inc.
- c. Briggs Plumbing Products, Inc.
- d. Eljer.
- e. Kohler Co.
- f. TOTO USA, Inc.

2. Description:

- a. Style: One piece.
 - 1) Bowl Type: Elongated, siphon jet with top spud.
 - 2) Design Consumption: 1.28 gal./flush
- b. Fixture Support: Water-closet support combination carrier.

2.8 URINALS

A. Urinals:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

- a. American Standard Companies, Inc.
- b. Briggs Plumbing Products, Inc.
- c. Duravit USA, Inc.
- d. Eljer.
- e. Kohler Co.
- f. Zum Plumbing Fixtures.
- g. TOTO USA, Inc.

2. Description

- a. Type: washout.
- b. Strainer or Trapway: Integral cast strainer with integral trap.
- c. Design Consumption: 0.13 gal./flush.
- d. Color: White
- e. Supply Spud Size: NPS ¾ top
- f. Outlet Size: NPS 2.
- g. Fixture Support: Urinal chair carrier.

2.9 LAVATORIES

A. Lavatories:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

- a. American Standard Companies, Inc.
- b. Eljer.
- c. Kohler Co.
- d. Barclay Products, Ltd.
- e. Briggs Plumbing Products, Inc.
- f. Gerber Plumbing Fixtures LLC.
- g. TOTO USA, Inc.

2. Description

- a. Color: White.
- b. Supplies: NPS 3/8 chrome-plated copper with stops.
- c. Drain: Grid, Grid with offset waste.
- d. Drain Piping: NPS 1-1/2 chrome-plated, cast-brass P-trap; 0.045-inch thick tubular brass waste to wall; and wall escutcheon.

2.10 SERVICE BASINS

A. Mop Sinks:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

- a. Acorn Engineering Company.
- b. Commercial Enameling Company.
- c. Florestone Products Co., Inc.
- d. Zurn Plumbing Products Group; Light Commercial Operation.
- e. Just Manufacturing Company

B. Service Sinks :

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

- a. American Standard Companies, Inc.
- b. Commercial Enameling Company.
- c. Eljer.
- d. Kohler Co.
- e. Crane Plumbing, L.L.C./Fiat Products.
- f. Just Manufacturing Company

2.11 SINKS

A. Pantry Sinks:

1. Manufacturers: Subject to compliance with requirements, provide by one of the following:

- a. Advance Tabco
- b. Elkay Manufacturing Co.
- c. Just Manufacturing Company
- d. Metal Masters Foodservice Equipment Co., Inc.

2. Drain Piping: 2" chrome-plated, cast-brass P-trap; 1.1-mm- thick tubular brass waste to wall; and wall escutcheon(s).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.
- B. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.
 - 1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
 - 2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
 - 3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.
- C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.
- D. Install wall-mounting fixtures with tubular waste piping attached to supports.
- E. Install counter-mounting fixtures in and attached to casework.
- F. Install fixtures level and plumb according to roughing-in drawings.
- G. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
 - 1. Exception: Use ball, gate, or globe valves if supply stops are not specified with fixture. Valves are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."
- H. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
- I. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.
- J. Install toilet seats on water closets.
- K. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.
- L. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required. Install temperature-actuated water mixing valves for individual lavatories as required.

- M. Install traps on fixture outlets.
 - 1. Exception: Omit trap on fixtures with integral traps.
 - 2. Exception: Omit trap on indirect wastes, unless otherwise indicated.
- N. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 22 Section "Common Work Results for Plumbing."
- O. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07 Section "Joint Sealants."

3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

- A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.
- B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.
- E. Install fresh batteries in sensor-operated mechanisms.

3.5 ADJUSTING

- A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.
- C. Replace washers and seals of leaking and dripping faucets and stops.
- D. Install fresh batteries in sensor-operated mechanisms.

3.6 CLEANING

- A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:
 - 1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
 - 2. Remove sediment and debris from drains.
- B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

3.7 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 22 40 00

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CONTRACT # 3
HVAC and FIRE PROTECTION WORK

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SECTION 21 05 00 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Mechanical sleeve seals.
3. Sleeves.
4. Escutcheons.
5. Grout.
6. Fire-suppression equipment and piping demolition.
7. Equipment installation requirements common to equipment sections.
8. Supports and anchorages.

1.3 SUBMITTALS

- A. Product Data: For the following:

1. Mechanical sleeve seals.
2. Escutcheons.

- B. Welding certificates.

1.4 QUALITY ASSURANCE

- A. **Steel Support Welding:** *Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."*
- B. **Electrical Characteristics for Fire-Suppression Equipment:** *Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.*

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

1.6 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for fire-suppression installations.

- B. Coordinate installation of required supporting devices..
- C. Coordinate requirements for access panels and doors for fire-suppression items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 21 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

- A. Refer to individual Division 21 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

2.4 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

2.5 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and an OD that completely covers opening.

- B. One-Piece, Cast-Brass Type: With set screw.
 - 1. Finish: Polished chrome-plated and exposed in finished areas and rough brass above hung ceiling and mechanical and electrical room.
- C. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.

PART 3 - EXECUTION

3.1 FIRE-SUPPRESSION DEMOLITION

- A. Refer to **DDC General Conditions** and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove fire-suppression systems, equipment, and components indicated to be removed.
 - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
 - 3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
- C. If pipe, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 21 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.

- I. Select system components with pressure rating equal to or greater than system operating pressure.
 - J. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
 - 1. New Piping
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - c. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - d. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with rough-brass finish.
 - e. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
 - f. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
 - K. Sleeves are not required for core-drilled holes.
 - L. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
 - 3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe. Use the following sleeve materials:
 - a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
 - b. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
 - 1) Seal space outside of sleeve fittings with firestop materials.
 - 4. Except for underground wall penetrations, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.
 - M. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.
- 3.3 PIPING JOINT CONSTRUCTION
- A. Join pipe and fittings according to the following requirements and Division 21 Sections specifying piping systems.

- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
 - C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
 - D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
 - E. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- 3.4 ERECTION OF METAL SUPPORTS AND ANCHORAGES
- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
 - B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor fire-suppression materials and equipment.
 - C. Field Welding: Comply with AWS D1.1.

END OF SECTION 21 05 00

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SECTION 21 05 48 - VIBRATION AND SEISMIC CONTROLS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Isolation pads.
 - 2. Isolation mounts.
 - 3. Restrained elastomeric isolation mounts.
 - 4. Restraining braces.

1.3 DEFINITIONS

- A. IBC: International Building Code.
- B. ICC-ES: ICC-Evaluation Service.
- C. OSHPD: Office of Statewide Health Planning and Development for the State of California.

1.4 PERFORMANCE REQUIREMENTS

- A. Seismic-Restraint Loading:
 - 1. Site Class as Defined in the IBC: "As per site specific study."
 - 2. Assigned Seismic Use Group or Building Category as Defined in the IBC: Seismic Use Group II (Occupancy Category III).
 - a. Component Importance Factor: See above.
 - b. Component Response Modification Factor: See above.
 - c. Component Amplification Factor: See above.
 - 3. Design Spectral Response Acceleration at Short Periods (0.2 Second): 0.3g, see note "**"
 - 4. Design Spectral Response Acceleration at 1-Second Period: 0.15g, see note "**".

"**"- PER SITE SPECIFIC STUDY, "THE DESIGN SPECTRUM MUST BE CONSIDERED IN ITS ENTIRE SPECTRUM OF PERIODS AND SUPERSEDE ANY GENERIC SITE CLASSIFICATION. THE VALUES FOR SA AT 0.2 SEC, S_{DS} (0.3G), AND SA AT 1.0 SEC, S_{D1} (0.15G), IN THIS RECOMMENDATION CANNOT BE USED TO GENERATE A RESPONSE SPECTRUM FOR THE SITE."

1.5 SUBMITTALS

- A. Product Data: For the following:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
 2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
 - a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
 - b. Annotate to indicate application of each product submitted and compliance with requirements.
- B. Delegated-Design Submittal: For vibration isolation and seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic forces required to select vibration isolators, seismic restraints, and for designing vibration isolation bases.
 2. Seismic-Restraint Details:
 - a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
 - b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacing. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
 - c. Preapproval and Evaluation Documentation: By an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).
- C. Welding certificates.
- D. Qualification Data: For professional engineer and testing agency.
- 1.6 QUALITY ASSURANCE
- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
 - B. Comply with seismic-restraint requirements in the IBC and NFPA 13 unless requirements in this Section are more stringent.
 - C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ace Mountings Co., Inc.
 2. Amber/Booth Company, Inc.
 3. California Dynamics Corporation.
 4. Isolation Technology, Inc.
 5. Kinetics Noise Control.
 6. Mason Industries.
 7. Vibration Eliminator Co., Inc.
 8. Vibration Isolation.
 9. Vibration Mountings & Controls, Inc.
- B. Pads : Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.
1. Resilient Material: Oil- and water-resistant neoprene, rubber, or hermetically sealed compressed fiberglass.
- C. Mounts : Double-deflection type, with molded, oil-resistant rubber, hermetically sealed compressed fiberglass, or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.
1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
 2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.
- D. Restrained Mounts: All-directional mountings with seismic restraint.
1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
 2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

2.2 SEISMIC-RESTRAINT DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Amber/Booth Company, Inc.
 2. California Dynamics Corporation.
 3. Cooper B-Line, Inc.; a division of Cooper Industries.
 4. Hilti, Inc.
 5. Kinetics Noise Control.
 6. Loos & Co.; Cableware Division.

7. Mason Industries.
 8. TOLCO Incorporated; a brand of NIBCO INC.
 9. Unistrut; Tyco International, Ltd.
- B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction.
1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- C. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.
- D. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.
- E. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.
- F. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.
- G. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.
- H. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.
- I. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.3 FACTORY FINISHES

- A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.
1. Powder coating on springs and housings.
 2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
 3. Baked enamel or powder coat for metal components on isolators for interior use.
 4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

- A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction.
- B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Equipment Restraints:
 - 1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
 - 2. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction providing required submittals for component.
- B. Piping Restraints:
 - 1. Comply with requirements in MSS SP-127 and NFPA 13.
 - 2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
 - 3. Brace a change of direction longer than 12 feet.
- C. Install cables so they do not bend across edges of adjacent equipment or building structure.
- D. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES an agency acceptable to authorities having jurisdiction providing required submittals for component.
- E. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
- F. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

- G. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- H. Drilled-in Anchors:
1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
 5. Set anchors to manufacturer's recommended torque, using a torque wrench.
 6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment.

END OF SECTION 21 05 48

SECTION 21 12 00 - FIRE-SUPPRESSION STANDPIPES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Pipes, fittings, and specialties.
- 2. Hose stations.
- 3. Pressure gages.

- B. Related Sections:

- 1. Division 21 Section "Wet-Pipe Sprinkler Systems" for wet-pipe sprinkler piping.

1.3 DEFINITIONS

- A. Standard-Pressure Standpipe Piping: Fire-suppression standpipe piping designed to operate at working pressure 175 psig maximum. Fittings shall be rated for 300 psi and valves shall be rated for 250 psi, wwp.

1.4 SYSTEM DESCRIPTIONS

- A. Automatic Wet-Type, Class III Standpipe System: Includes NPS 1-1/2 hose stations and NPS 2-1/2 hose connections. Has open water-supply valve with pressure maintained and is capable of supplying water demand.

1.5 PERFORMANCE REQUIREMENTS

- A. Standard-Pressure, Fire-Suppression Standpipe System Component: Listed for 175-psig minimum working pressure. Fittings shall be rated for 300 psi and valves shall be rated for 250 psi, wwp.

- B. Fire-suppression standpipe design shall be approved by authorities having jurisdiction.

- 1. Minimum residual pressure at each hose-connection outlet is as follows:

- a. NPS 1-1/2 Hose Connections: 65 psig.

- 2. Maximum residual pressure at required flow at each hose-connection outlet is as follows unless otherwise indicated:

- a. NPS 1-1/2 Hose Connections: 100 psig.

1.6 SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Shop Drawings: For fire-suppression standpipes. Include plans, elevations, sections, details, and attachments to other work.
- C. Coordination Drawings: Fire-suppression standpipes, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Domestic water piping.
 - 2. Sanitary waste piping.
 - 3. HVAC hydronic piping.
 - 4. Sprinkler piping.
- D. Qualification Data: For qualified Installer.
- E. Approved Standpipe Drawings: Working plans, prepared according to New York City Building Code, that have been approved by authorities having jurisdiction.
- F. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in York City Building Code. Include "Contractor's Material and Test Certificate for Aboveground Piping."
- G. Field quality-control reports.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer's responsibilities include, fabricating, and installing fire-suppression standpipes.

1.8 PROJECT CONDITIONS

- A. Interruption of Existing Fire-Suppression Standpipe Service: Do not interrupt fire-suppression standpipe service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary fire-suppression standpipe service according to requirements indicated:
 - 1. Notify Construction Manager no fewer than five days in advance of proposed interruption of fire-suppression standpipe service.
 - 2. Do not proceed with interruption of fire-suppression standpipe service without Construction Manager's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

2.2 STEEL PIPE AND FITTINGS

- A. Standard Weight, Black-Steel Pipe: ASTM A 53/A 53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.

- B. Standard-Weight, Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, seamless steel pipe with threaded ends.
- C. Uncoated, Steel Couplings: ASTM A 865, threaded.
- D. Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern, 300 psig wwp.
- E. Malleable- or Ductile-Iron Unions: UL 860.
- F. Cast-Iron Flanges: ASME B16.1, Class 125, 300 psig wwp.
- G. Grooved-Joint, Steel-Pipe Appurtenances:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Anvil International, Inc.
 - b. Corcoran Piping System Co.
 - c. National Fittings, Inc.
 - d. Shurjoint Piping Products.
 - e. Tyco Fire & Building Products LP.
 - f. Victaulic Company.
 - 2. Pressure Rating: 300 psig minimum.
 - 3. Uncoated, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
 - 4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.3 NPS 1-1/2 BY NPS 2-1/2 RACK-TYPE HOSE STATIONS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. AFAC Inc.
 - 2. American Fire Hose & Cabinet.
 - 3. Angus; Part of Kidde Fire Fighting Organization.
 - 4. Elkhart Brass Mfg. Company, Inc.
 - 5. Fire-End & Croker Corporation.
 - 6. GMR International Equipment Corporation.
 - 7. Potter Roemer.
- B. Hose Rack:
 - 1. Standard: UL 47, NY City BS & A Approved.
 - 2. Material: Steel with red-enamel finish.
 - 3. Type: Hose-rack assembly. Include hose valve, reducer adapter, hose rack, water-retention device, hose pins, and hose.
 - 4. Operation: Semiautomatic.
 - 5. Sized to hold 125 ft. of 1 1/2 inch fire hose.

C. Hose Valve:

1. Standard: UL 668, NPS 2-1/2, for connecting fire hose.
2. Type: Nonadjustable.
3. Pressure-Control Device: Pressure restricting.
4. Design Outlet Pressure Setting: 85 psig.
5. Hose Valve and Trim Finish: Polished chrome plated.
6. Pressure Rating: 300 psig minimum.
7. Pattern: Angle.
8. Material: Brass or bronze.
9. Pressure-Control Device: UL 1468, integral or for field installation.
10. Size: NPS 2-1/2.
11. Inlet: Female pipe threads.
12. Outlet: Male hose threads according to NFPA 1963 and matching local fire-department threads.
13. Reducer Adapter: NPS 2-1/2 by NPS 1-1/2.

D. Hose:

1. Standards: NFPA 1961 and UL 219, NY City BS & A Approved lined fire hose with swivel inlet, coupling, gaskets, and nozzle.
2. Size: NPS 1-1/2.
3. Length: 125 feet.
4. Jacket: Natural thread.
5. Lining: Combination of rubber and plastic compounds.
6. Nozzle: UL 401 spray nozzle unless plain nozzle is indicated.
 - a. Material: Polycarbonate plastic.
 - b. Type: Spray, adjustable from shutoff to fog spray or straight stream.

2.4 ESCUTCHEONS

- A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.
- B. One-Piece, Cast-Brass Escutcheons: rough-brass finish with set-screws.
- C. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

2.5 SLEEVES

- A. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, standard weight, zinc coated, plain ends.
- C. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 1. Underdeck Clamp: Clamping ring with set-screws.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for hose stations to verify actual locations of piping connections before installation.
- B. Examine walls and partitions for suitable thickness, fire- and smoke-rated construction, framing for hose-station cabinets, and other conditions where hose connections and stations are to be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 WATER-SUPPLY CONNECTIONS

- A. Connect fire-suppression standpipe piping to building's interior existing standpipe distribution piping.

3.3 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
 - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
- B. Piping Standard: Comply with requirements of NY City Building Code for installation of fire-suppression standpipe piping.
- C. Install listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- D. Install drain valves on low points of standpipes.
- E. Install hangers and supports for standpipe system piping according to NY City Building Code. Comply with requirements in NFPA 13 for hanger materials.
- F. Fill wet-type standpipe system piping with water.

3.4 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.
- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.
- I. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- J. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.5 HOSE-STATION INSTALLATION

- A. Install NPS 2-1/2 hose connections with quick-disconnect NPS 2-1/2 by NPS 1-1/2 reducer adapter and flow-restricting device unless otherwise indicated.
- B. Install wall-mounted, rack hose stations in recessed cabinets. Include pipe escutcheons, with finish matching valves, inside cabinet where water-supply piping penetrates cabinet. Install valves at angle required for connection of fire hose.

3.6 ESCUTCHEON INSTALLATION

- A. Install escutcheons for penetrations of walls, ceilings, and floors.
- B. Escutcheons for New Piping:
 - 1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
 - 2. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
 - 3. Bare Piping at Ceiling Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
 - 4. Bare Piping in Unfinished Service Spaces: One piece, cast brass with rough-brass finish.
 - 5. Bare Piping in Equipment Rooms: One piece, cast brass.
 - 6. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece floor plate.

3.7 SLEEVE INSTALLATION

- A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.

- B. Sleeves are not required for core-drilled holes.
- C. Permanent sleeves are not required for holes formed by removable PE sleeves.
- D. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.
- E. Install sleeves in new partitions, slabs, and walls as they are built.
- F. For interior wall penetrations, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Division 07 Section "Joint Sealants."
- G. Seal space outside of sleeves in concrete slabs and walls with firestop materials .
- H. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe unless otherwise indicated.
- I. Install sleeve materials according to the following applications:
 - 1. Sleeves for Piping Passing through Concrete Floor Slabs: Galvanized-steel pipe.
 - 2. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical Equipment Areas or Other Wet Areas: Galvanized-steel pipe.
 - a. Extend sleeves 2 inches above finished floor level.
 - b. For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
 - 3. Sleeves for Piping Passing through Gypsum-Board Partitions:
 - a. Galvanized-steel-pipe sleeves for pipes smaller than NPS 6.
 - 4. Sleeves for Piping Passing through Interior Concrete Walls:
 - a. Galvanized-steel-pipe sleeves for pipes smaller than NPS 6.
- J. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestop materials and installations in Division 07 Section "Penetration Firestopping."

3.8 IDENTIFICATION

- A. Install labeling and pipe markers on piping according to requirements in NFPA 14.

3.9 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.

2. Maintain the hydrostatic test pressure of the completed standpipe system 200 psig for at least 2 hrs.
 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 4. Flush, test, and inspect standpipe systems according to NY City Building Code "Inspection and Test" Section.
 5. Coordinate with fire-pump tests. Operate as required.
 6. Verify that equipment hose threads are same as local fire-department equipment.
- C. Fire-suppression standpipe system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
- 3.10 PIPING SCHEDULE
- A. Standard-pressure, wet-type, fire-suppression standpipe piping, NPS 4 and smaller, shall be one of the following:
1. Standard-weight black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
 2. Standard-weight , black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

END OF SECTION 21 12 00

SECTION 21 13 13 - WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Pipes, fittings, and specialties.
2. Fire-protection valves.
3. Sprinklers.
4. Alarm devices.
5. Pressure gages.

- B. Related Sections:

1. Division 21 Section "Fire-Suppression Standpipes" for standpipe piping.

1.3 DEFINITIONS

- A. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175 psig maximum.

1.4 SYSTEM DESCRIPTIONS

- A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply through alarm valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.

1.5 PERFORMANCE REQUIREMENTS

- A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

- B. Sprinkler system design shall be approved by authorities having jurisdiction.

1. Margin of Safety for Available Water Flow and Pressure: 5 percent, including losses through water-service piping, valves, and backflow preventers.

- a. Sprinkler Occupancy Hazard Classifications as indicated on the drawings.

- C. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13.

1.6 SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. LEED Submittal
 - 1. Product Data for Credit EQ 4.1: For solvent cements and adhesive primers, including printed statement of VOC content and chemical components.
 - C. Shop Drawings: For wet-pipe sprinkler systems. Include plans, elevations, sections, details, and attachments to other work, including hydraulic calculations.
 - 1. Wiring Diagrams: For power, signal, and control wiring.
 - D. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Domestic water piping.
 - 2. Sanitary waste piping.
 - 3. HVAC ductwork and piping.
 - 4. Items penetrating finished ceiling include the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - E. Qualification Data: For qualified Installer.
 - F. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations.
 - G. Fire-hydrant flow test report.
 - H. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
 - I. Field quality-control reports.
 - J. Operation and Maintenance Data: For sprinkler specialties to include in emergency, operation, and maintenance manuals.
- 1.7 QUALITY ASSURANCE
- A. Installer Qualifications:
 - 1. Installer's responsibilities include, fabricating, and installing sprinkler systems. Base calculations on results of fire-hydrant flow test.
 - B. Electrical Components, Devices, and Accessories: U.L. Listed and labeled as defined in NFPA 70, and marked for intended location and application.
 - C. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:
 - 1. NFPA 13, "Installation of Sprinkler Systems."

1.8 PROJECT CONDITIONS

- A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by City of New York or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:
1. Notify Construction Manager no fewer than five days in advance of proposed interruption of sprinkler service.
 - a. Do not proceed with interruption of sprinkler service without Construction Manager's written permission.

1.9 COORDINATION

- A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

1.10 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

2.2 STEEL PIPE AND FITTINGS

- A. Standard Weight, Black-Steel Pipe: ASTM A 53/A 53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.
- B. Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.
- C. Uncoated, Steel Couplings: ASTM A 865, threaded.
- D. Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
- E. Malleable- or Ductile-Iron Unions: UL 860.
- F. Cast-Iron Flanges: ASME 16.1, Class 125.
- G. Grooved-Joint, Steel-Pipe Appurtenances:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Anvil International, Inc.
 - b. Corcoran Piping System Co.
 - c. National Fittings, Inc.
 - d. Shurjoint Piping Products.
 - e. Tyco Fire & Building Products LP.
 - f. Victaulic Company.
 2. Pressure Rating: 175 psig minimum.
 - a. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.
- 2.3 PIPING JOINING MATERIALS
- A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free.
 1. Class 125, Cast-Iron Flanges and Class 150, Bronze Flat-Face Flanges: Full-face gaskets.
 - B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, stainless steel.
- 2.4 LISTED FIRE-PROTECTION VALVES
- A. General Requirements:
 1. Valves shall be UL listed or FM approved.
 - a. Minimum Pressure Rating for Standard-Pressure Piping: 175 psig.
 - B. Ball Valves:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Anvil International, Inc.
 - b. Victaulic Company.
 2. Standard: UL 1091 except with ball instead of disc.
 - a. Valves NPS 1-1/2 and Smaller: Bronze body with threaded ends.
 - C. Iron OS&Y Gate Valves:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Clow Valve Company; a division of McWane, Inc.
- b. Crane Co.; Crane Valve Group.
- c. Hammond Valve.
- d. Milwaukee Valve Company.
- e. Mueller Co.; Water Products Division.
- f. NIBCO INC.
- g. Tyco Fire & Building Products LP.
- h. Victaulic Company

2. Standard: UL 262.

- a. Pressure Rating: 250 psig minimum.
- b. Body Material: Cast or ductile iron.
- c. End Connections: Flanged or grooved.

D. Indicating-Type Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Anvil International, Inc.
- b. Kennedy Valve; a division of McWane, Inc.
- c. Milwaukee Valve Company.
- d. NIBCO INC.
- e. Tyco Fire & Building Products LP.
- f. Victaulic Company.

2. Standard: UL 1091.

- a. Pressure Rating: 175 psig minimum.
- b. Valves NPS 2 and Smaller:
- c. Valve Type: Ball or butterfly.
- d. Body Material: Bronze.
- e. End Connections: Threaded.

3. Valves NPS 2-1/2 and Larger:

- a. Valve Type: Butterfly.
- b. Body Material: Cast or ductile iron.
- c. End Connections: Flanged, grooved, or wafer.

4. Valve Operation: Integral electrical, 115-V ac, prewired, single-circuit, supervisory switch visual indicating device.

2.5 TRIM AND DRAIN VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
 - a. Pressure Rating: 175 psig minimum.

B. Angle Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fire Protection Products, Inc.
 - b. United Brass Works, Inc.

C. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Anvil International, Inc.
 - b. Conbraco Industries, Inc.; Apollo Valves.
 - c. Fire-End & Croker Corporation.
 - d. Kennedy Valve; a division of McWane, Inc.
 - e. Milwaukee Valve Company.
 - f. NIBCO INC.
 - g. Potter Roemer.
 - h. Tyco Fire & Building Products LP.
 - i. Victaulic Company.

D. Globe Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fire Protection Products, Inc.
 - b. United Brass Works, Inc.

2.6 SPRINKLER SPECIALTY PIPE FITTINGS

A. Branch Outlet Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Anvil International, Inc.
 - b. National Fittings, Inc.
 - c. Tyco Fire & Building Products LP.
 - d. Victaulic Company.
2. Standard: UL 213.
 - a. Pressure Rating: 175 psig minimum
 - b. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
 - c. Type: Mechanical-T and -cross fittings.
 - d. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.

- e. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
- f. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AGF Manufacturing Inc.
 - b. Reliable Automatic Sprinkler Co., Inc.
 - c. Tyco Fire & Building Products LP.
 - d. Victaulic Company.
- 2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
 - a. Pressure Rating: 175 psig minimum.
 - b. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
 - c. Size: Same as connected piping.
 - d. Inlet and Outlet: Threaded.

C. Adjustable Drop Nipples:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. CECA, LLC.
 - b. Corcoran Piping System Co.
 - c. Merit Manufacturing; a division of Anvil International, Inc.
- 2. Standard: UL 1474.
 - a. Pressure Rating: 250 psig minimum.
 - b. Body Material: Steel pipe with EPDM-rubber O-ring seals.
 - c. Size: Same as connected piping.
 - d. Length: Adjustable.
 - e. Inlet and Outlet: Threaded.

2.7 SPRINKLERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Reliable Automatic Sprinkler Co., Inc.
 - 2. Tyco Fire & Building Products LP.
 - 3. Venus Fire Protection Ltd.
 - 4. Victaulic Company.
 - 5. Viking Corporation.

B. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
 - a. Pressure Rating for Automatic Sprinklers: 175 psig minimum.

C. Automatic Sprinklers with Heat-Responsive Element:

1. Early-Suppression, Fast-Response Applications: UL 1767.
 - a. Nonresidential Applications: UL 199.
 - b. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

D. Sprinkler Finishes as indicated on the drawings:

1. Chrome plated.
2. Bronze.
3. Painted.

E. Special Coatings:

1. Wax.
2. Corrosion-resistant paint.

F. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Chrome-plated steel, two piece, with 1-inch vertical adjustment.
 - a. Sidewall Mounting: Chrome-plated steel one piece, flat.

G. Sprinkler Guards (in all mechanical, electrical, storage rooms, scene shop and stage area):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Reliable Automatic Sprinkler Co., Inc.
 - b. Tyco Fire & Building Products LP.
 - c. Victaulic Company.
 - d. Viking Corporation.
2. Standard: UL 199.
 - a. Type: Wire cage with fastening device for attaching to sprinkler.

2.8 ALARM DEVICES

- A. Alarm-device types shall match piping and equipment connections.

B. Water-Flow Indicators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ADT Security Services, Inc.
 - b. Potter Electric Signal Company.
 - c. System Sensor; a Honeywell company.
 - d. Viking Corporation.
 - e. Watts Industries (Canada) Inc.
2. Standard: UL 346.
 - a. Water-Flow Detector: Electrically supervised.
 - b. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
 - c. Type: Paddle operated.
 - d. Pressure Rating: 250 psig.
 - e. Design Installation: Horizontal or vertical.

C. Valve Supervisory Switches:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fire-Lite Alarms, Inc.; a Honeywell company.
 - b. Kennedy Valve; a division of McWane, Inc.
 - c. Potter Electric Signal Company.
 - d. System Sensor; a Honeywell company.
2. Standard: UL 346.
 - a. Type: Electrically supervised.
 - b. Components: Single-pole, double-throw switch with normally closed contacts.
 - c. Design: Signals that controlled valve is in other than fully open position.

2.9 PRESSURE GAGES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. AMETEK; U.S. Gauge Division.
 - a. Ashcroft, Inc.
 - b. Brecco Corporation.
 - c. WIKA Instrument Corporation.
- B. Standard: UL 393.

- C. Dial Size: 3-1/2- to 4-1/2-inch diameter.
 - D. Pressure Gage Range: 0 to 250 psig minimum.
 - E. Water System Piping Gage: Include "WATER" label on dial face.
- 2.10 ESCUTCHEONS
- A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.
 - B. One-Piece, Cast-Brass Escutcheons: Polished chrome-plated in finished areas or rough-brass in back-of-house areas finish with set-screws.
- 2.11 SLEEVES
- A. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
 - B. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, standard weight, zinc coated, plain ends.
 - C. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - 1. Underdeck Clamp: Clamping ring with set-screws.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Use hydrant flow test results for system design calculations required in "Quality Assurance" Article.
- B. Report test results promptly and in writing.

3.2 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
 - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
- B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.
- C. Install seismic restraints on piping. Comply with requirements for seismic-restraint device materials and installation in NFPA 13.
- D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- E. Install unions adjacent to each valve in pipes NPS 2 and smaller.

- F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, having NPS 2-1/2 and larger end connections.
- G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.
- H. Install sprinkler piping with drains for complete system drainage.
- I. Install sprinkler control valves, test assemblies, and drain.
- J. Install alarm devices in piping systems.
- K. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.
- L. Install pressure gages at sprinkler test connection. Include pressure gages with connection not less than NPS 1/4 and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.
- M. Fill sprinkler system piping with water.

3.3 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves having NPS 2-1/2 and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.
- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - a. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

- I. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- J. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, controls, and specialties according to NFPA 13 and authorities having jurisdiction.
- B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply. Install permanent identification signs indicating portion of system controlled by each valve.

3.5 SPRINKLER INSTALLATION

- A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels, or as indicated on drawings.
- B. Install sprinklers into flexible, sprinkler hose fittings and install hose into bracket on ceiling grid.

3.6 ESCUTCHEON INSTALLATION

- A. Install escutcheons for penetrations of walls, ceilings, and floors.
- B. Escutcheons for New Piping:
 - 1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
 - a. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
 - b. Bare Piping in Unfinished Service Spaces: One piece, cast brass with rough-brass finish.
 - c. Bare Piping in Equipment Rooms: One piece, cast brass stamped steel with set-screw.
 - d. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece floor plate.
- C. Escutcheons for Existing Piping

3.7 SLEEVE INSTALLATION

- A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, and walls.
- B. Sleeves are not required for core-drilled holes.
- C. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.
- D. Install sleeves in new partitions, slabs, and walls as they are built.

- E. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Division 07 Section "Joint Sealants."
- F. Seal space outside of sleeves in concrete slabs and walls with grout.
- G. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe unless otherwise indicated.
- H. Install sleeve materials according to the following applications:
 - 1. Sleeves for Piping Passing through Concrete Floor Slabs: Galvanized-steel pipe.
 - a. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical Equipment Areas or Other Wet Areas: Galvanized-steel pipe.
 - b. Extend sleeves 2 inches above finished floor level.
 - c. For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Comply with requirements for flashing in Division 07 Section "Sheet Metal Flashing and Trim."
 - 2. Sleeves for Piping Passing through Gypsum-Board Partitions:
 - a. Galvanized-steel-pipe sleeves for pipes smaller than NPS 6.
 - 3. Sleeves for Piping Passing through Interior Concrete Walls:
 - a. Galvanized-steel-pipe sleeves for pipes smaller than NPS 6.
- I. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestop materials and installations in Division 07 Section "Penetration Firestopping."

3.8 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.
- B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.9 FIELD QUALITY CONTROL

- A. Perform tests and inspections in conformance with the NY City Building Code.
- B. Tests and Inspections:
 - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
 - a. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

- b. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
 - c. Energize circuits to electrical equipment and devices.
 - d. Coordinate with fire-alarm tests. Operate as required.
- C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.10 CLEANING

- A. Clean dirt and debris from sprinklers.
- B. Remove and replace sprinklers with paint other than factory finish.

3.11 PIPING SCHEDULE

- A. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.
- B. Standard-pressure, wet-pipe sprinkler system, NPS 2 and smaller, shall be one of the following:
 - 1. Standard-weight black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
 - 2. Standard-weight galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
- C. Standard-pressure, wet-pipe sprinkler system, NPS 2 1/2 to NPS 4, shall be one of the following:
 - 1. Standard-weight black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - 2. Standard-weight galvanized -steel pipe with cut- or roll-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
- D. Piping and fittings for drain and test connection shall be galvanized.

3.12 SPRINKLER SCHEDULE

- A. Use sprinkler types in subparagraphs below for the following applications:
 - 1. Rooms without Ceilings: Upright sprinklers.
 - 2. Rooms with Suspended Ceilings: Pendent, recessed, flush, and concealed sprinklers as indicated on drawings.
 - 3. Wall Mounting: Sidewall sprinklers.
 - 4. Spaces Subject to Freezing: Pendent, dry sprinklers.
- B. Provide sprinkler types with finishes indicated on the drawings.

END OF SECTION 21 13 13

SECTION 230013 - HVAC CONTRACTOR WORK

ALLOWANCE FOR INCIDENTAL ASBESTOS ABATEMENT

1.01 SCOPE FOR ASBESTOS ABATEMENT WORK

- A. The "General Conditions" apply to the work of this Section.
- B. The Asbestos abatement contractor shall remove asbestos containing materials as needed to perform the other work of this Contract when discovered during the course of work. When required, the Asbestos abatement contractor shall replace the ACM with non-asbestos containing materials. An allowance of **\$15,000.00** for the **HVAC Contractor** is herein established for this incidental work when so ordered and authorized by the Commissioner.
- C. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE APPLICABLE PROVISIONS OF THE RULES AND REGULATIONS OF THE ASBESTOS CONTROL PROGRAM AS PROMULGATED BY TITLE 15 CHAPTER I OF RCNY AND NEW YORK STATE DEPARTMENT OF LABOR INDUSTRIAL CODE RULE 56 CITED AS 12 NYCRR, PART 56 WHICHEVER IS MORE STRINGENT AS PER LATEST AMENDMENTS TO THESE LAWS AND AS MODIFIED HEREIN BY THESE SPECIFICATIONS.
- D. ALL DISPOSAL OF ASBESTOS CONTAMINATED MATERIAL SHALL BE PER LOCAL LAW 70/85.
- E. THE ASBESTOS ABATEMENT CONTRACTOR'S ATTENTION IS DIRECTED TO THE FACT THAT CERTAIN METHODS OF ASBESTOS ABATEMENT ARE PROTECTED BY PATENTS. TO DATE, PATENTS HAVE BEEN ISSUED WITH RESPECT TO "NEGATIVE PRESSURE ENCLOSURE" OR "NEGATIVE-AIR" OR "REDUCED PRESSURE" AND "GLOVE BAG".
- F. THE ASBESTOS ABATEMENT CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR AND SHALL HOLD THE DEPARTMENT OF DESIGN AND CONSTRUCTION AND THE CITY HARMLESS FROM ANY AND ALL DAMAGES, LOSSES AND EXPENSES RESULTING FROM ANY INFRINGEMENT BY THE ASBESTOS ABATEMENT CONTRACTOR OF ANY PATENT, INCLUDING BUT NOT LIMITED TO THE PATENTS DESCRIBED ABOVE, USED BY THE ASBESTOS ABATEMENT CONTRACTOR DURING PERFORMANCE OF THIS AGREEMENT.
- G. "Asbestos" shall mean any hydrated mineral silicate separable into commercially usable fibers, including but not limited to chrysotile (serpentine), amosite (cumingtonite-grunerite), crocidolite (riebeckite), tremolite, anthrophyllite and actinolite.

- H. Prior to starting, the Asbestos abatement contractor must notify the Commissioner of the Department of Design and Construction if he/she anticipates any difficulty in performing the Work as required by these Specifications. The Asbestos abatement contractor is responsible to prepare and submit all filings, notifications, etc. required by all City, State and Federal regulatory agencies having jurisdiction.

The Asbestos abatement contractor is responsible for submitting the Asbestos Project Notification Form (ACP-7 Form) to the Department of Environmental Protection, Asbestos Control Program, as per Title 15, Chapter I of RCNY and to the NYSDOL as per Industrial Code Rule 56.

The Asbestos abatement contractor is responsible for preparing, and submitting Asbestos Variance Application (ACP-9). If a Variance is required, the Asbestos abatement contractor is responsible to retain a NYSDOL Asbestos Project Designer, as defined in Title 15, Chapter 1 of the RCNY to prepare and submit the required variance.

The Asbestos abatement contractor is responsible for preparing and submitting an Asbestos Abatement Permit and/or Work Place Safety Plans (WPSP) that may be required for the completion of the Contract or incidental work. If such plans are required, the Asbestos abatement contractor is responsible to retain a NYSDOL Licensed Design Professional as defined in Title 15, Chapter 1 of the RCNY to prepare and submit the required plans.

The Asbestos abatement contractor is responsible for the submission of all required documents to the NYCDEP to acquire the appropriate Asbestos Project Conditional Closeout (ACP-20) and/or Asbestos Project Completion Forms (ACP-21) on a timely basis for the completion of the incidental work encountered under this contract.

The Asbestos abatement contractor will be required to attend an on-site job meeting with the Construction Project Manager prior to the start of work to examine conditions and plan the sequence of operations, etc.

The Asbestos abatement contractor shall have a NYSDOL/NYCDEP Asbestos Supervisor onsite to oversee the work and conduct a final visual inspection as required by both Title 15, Chapter 1 of the RCNY and NYSDOL Industrial Code Rule 56.

- I. All work shall be done during regular working hours unless the Asbestos abatement contractor requests authorization to work in other than regular working hours and such authorization is granted by the Commissioner. (Regular work hours are those hours during which any given facility, in which work is to be done, is customarily open and functioning, normally between the hours of 8:00 A.M. and 4:00 P.M. Monday - Friday.) If such work schedule is authorized by the Commissioner, the work shall be done at no additional cost to the City.

- J. The Commissioner may order that work be done in other than regular working hours as herein by defined and this order may require the Asbestos abatement contractor to pay premium or overtime wages to complete the work. If the Commissioner orders work in other than regular working hours, the Asbestos abatement contractor shall multiply the unit price for that portion of the work requiring premium wages by 1.50 when computing payment in accordance with Paragraph 1.09. All requests for premium payment must be supported by certified payroll sheets and field sheets approved by the Construction Project Manager.

1.02 QUALIFICATIONS OF ASBESTOS ABATEMENT CONTRACTOR

- A. Requirements: The asbestos abatement contractor must demonstrate compliance with the special experience requirements set forth in subparagraphs (1) through (5) below. The asbestos abatement contractor must, submit documentation demonstrating compliance with all listed requirements. Such documentation shall include without limitation, all required licenses, certificates, and documentation.
1. The asbestos abatement contractor must, whether an individual, corporation, partnership, joint venture or other legal entity, must demonstrate for the three year period prior to the work, that it has been licensed by the New York State Department of Labor, as an "Asbestos abatement contractor".
 2. The asbestos abatement contractor must, for the three year period prior to the work, have been in the business of providing asbestos abatement services as a routine part of its daily operations.
 3. The asbestos abatement contractor proposing to do asbestos abatement work must be thoroughly experienced in such work and must provide evidence of having successfully performed and completed in a timely fashion at least five (5) asbestos abatement projects of similar size and complexity. The aggregate cost of these projects must be at least \$250,000.00 in each of the three years.
 4. For each project submitted to meet the experience requirements set forth above, the asbestos abatement contractor must submit the following information for the project; name and location of the project; name title and telephone number of the owner or the owner's representative who is familiar with the asbestos abatement contractor's work, brief description of the work completed as a prime or sub-asbestos abatement contractor; amount of contract or subcontract and the date of completion.
 5. The asbestos abatement contractor must demonstrate that it has the financial resources, supervisory personnel and equipment necessary to carry out the work and to comply with the required performance schedule, taking into consideration other business commitments. The asbestos

abatement contractor must submit such documentation as may be required by the Department of Design and Construction to demonstrate that it has the requisite capacity to perform the required services of this contract.

- B. Insurance Requirements: The asbestos abatement contractor must provide asbestos liability insurance in the following amount: 1 million dollars per occurrence, 2 million dollars aggregate (combined single limit). The City of New York shall be named as an additional insured on such insurance policy.
- C. Throughout the specifications, reference is made to codes and standards which establish qualities and types of workmanship and materials, and which establish methods for testing and reporting on the pertinent characteristics thereof.

1.03 ASBESTOS ABATEMENT CONTRACTOR RESPONSIBILITIES

The Asbestos abatement contractor will visit the subject location within one (1) working day of notification to ascertain actual work required. If the project is identified as being "urgent", then work shall commence no later than 48 hours from the time of notification. In this event, the asbestos abatement contractor shall immediately notify when applicable EPA NESHAPS Coordinator, NYSDOL Asbestos Control Bureau and NYCDEP Asbestos Control Program of start of the work and file the necessary Asbestos Notifications and any applicable Variance Applications with the regulatory agencies cited above..

In the event that the project is not classified as "urgent" the Asbestos abatement contractor shall notify the EPA NESHAPS Coordinator, NYSDOL and NYCDEP by submitting the requisite asbestos project notification forms, postmarked 10 days before activity begins if 260 linear feet or more and/or 160 square feet or more of asbestos containing material will be disturbed.

The following information must be included in the notification:

- A. Name and address of building City or operator;
- B. Project description:
 - 1. Size - square feet, number of linear feet, etc;
 - 2. Age - date of construction and renovations (if known);
 - 3. Use - i.e., office, school, industrial, etc.
 - 4. Scope - repair, demolition, cleaning, etc.
- C. Amount of asbestos involved in work and an explanation of techniques used to determine the amount;

- D. Building location/address, including Block and Lot numbers;
- E. Work schedule including the starting and completion dates;
- F. Abatement methods to be employed;
- G. Procedures for removal of asbestos-containing material;
- H. Name, title and authority of governmental representative sponsoring project.

1.04 WORK INCLUDED IN UNIT PRICE

The Asbestos abatement contractor will be paid a basic unit price of **\$25.00** per square feet for the removal and disposal of asbestos containing material and replacement of the same with non-asbestos containing materials.

Unit price shall include all costs necessary to do the work of this Contract, including but not limited to: labor, materials, equipment, utilities, disposal, insurance, overhead and profit.

1.05 AIR MONITORING – ASBESTOS ABATEMENT CONTRACTOR

- A. "Air Sampling" shall mean the process of measuring the fiber content of a known volume of air collected during a specific period of time. The procedure utilized for asbestos follows the NIOSH Standard Analytical Method 7400 or the provisional transmission electron microscopy methods developed by the USEPA and/or National Institute of Standard and Technology which are utilized for lower detectability and specific fiber identification.
- B. Air monitoring of Asbestos abatement contractor's personnel will be performed in conformance with OSHA requirements, (All costs associated with this work are deemed included in the unit price.).
- C. Qualifications of Testing Laboratory:

The industrial hygiene laboratory shall be a current proficient participant in the American Industrial Hygiene Association (AIHA) PAT Program. The laboratory identification number shall be submitted and approved by the City. The laboratory shall be accredited by the AIHA and New York State Department of Health Environmental Laboratory Approval Program (ELAP).

Note: Work area air testing and analysis before, during and upon completion of work (clearance testing) will be performed by a Third Party Air Monitor under separate Contract with the City.

1.06 THIRD PARTY MONITORING AND LABORATORY

- A. The NYCDDC, at its own expense, will employ the services of an independent Third Party Air Monitoring Firm and Laboratory. The Third Party Air Monitor will perform air sampling activities and project monitoring at the Work Site.
- B. The Laboratory will perform analysis of air samples utilizing Phase Contrast Microscopy (PCM) and/or Transmission Electron Microscopy (TEM).
- C. The Third Party Air Monitoring Firm and the designated Project Monitor shall have access to all areas of the asbestos removal project at all times and shall continuously inspect and monitor the performance of the Asbestos abatement contractor to verify that said performance complies with this Specification. The Third-Party Air Monitor shall be on site throughout the entire abatement operation.
- D. The NYCDDC will be responsible for costs incurred with the Third Party Air Monitoring Firm and laboratory work. Any subsequent additional testing required due to limits exceeded during initial testing shall be paid for by the Asbestos abatement contractor.

1.07 PAYMENT REQUEST DOCUMENTATION

- B. The following information shall be included for each payment request:
 - 1. Description of work performed.
 - 2. Linear footage and pipe sizes involved.
 - 3. Square footage for boiler & breaching insulation removed.
 - 4. Square footage of non pipe and boiler areas removed, patched, enclosed, sealed, or painted.
 - 5. Square footage of encapsulation, sealing, patching, and painting involved.
 - 6. Total cost associated with compliance with the assigned task.
 - 7. Architectural, Electrical, HVAC, Plumbing, etc. work incidental to the Asbestos Abatement Work.
 - 8. A certified copy (in form 4312-39) to the Comptroller or Financial Officer of the New York City to the effect that the financial statement is true.
 - 9. A signed copy (in form 6506q-6) of certificate of compliance with non-discriminatory provisions of the Contract.

10. Attach a copy of valid workmen compensation insurance.
 11. Valid asbestos insurance per occurrence.
 12. General liability insurance when required.
- C. Each payment request shall include a grand total for all work completed that billing period, the landfill waste manifests and a copy of waste transporter permit. The Department of Design and Construction will inspect the work performed, review the cost and approve or disapprove requests for payment.
- D. EXPOSURE LOG: With this final payment, the Asbestos abatement contractor shall submit a listing of the names and social security numbers of all employees actively engaged in the abatement work of this Contract. This list shall include a summary showing each part of the abatement work in which the employee was engaged and the dates thereof.

1.08 QUANTITY CALCULATIONS

In order to determine the square footage involved for the various pipe sizes of pipe insulation that might be encountered, the following table is to be used.

<u>PIPE INSULATION SIZE O.D.</u>	<u>PIPE SIZE O.D.</u>	<u>SQUARE FOOTAGE PER LINEAR FOOT</u>
2-1/2"	1/2"	0.65
2-3/4"	3/4"	0.72
3"	1"	0.79
3-1/4"	1-1/4"	0.85
3-1/2"	1-1/2"	0.92
4"	2"	1.05
4-1/2"	2-1/2"	1.18
5"	3"	1.31
6"	3-1/4"	1.57
7"	3-1/2"	1.83
8"	4"	2.09
9"	5"	2.36
10"	6"	2.62
12"	8"	3.14
14"	10"	3.67
16"	12"	4.19
18"	14"	4.71

1.09 METHOD OF PAYMENT

Payment shall be made in accordance with Items A through R below. Payment shall be calculated based on the actual quantity of the item performed by the asbestos abatement

contractor, times the unit price specified below. Credits may apply to certain times, as specified below.

- A. **REMOVAL, DISPOSAL AND REPLACEMENT OF ASBESTOS CONTAINING PIPE INSULATION:** Actual linear footage, multiplied by the square footage factor listed for the respective pipe size in Section 1.09, multiplied by the unit price in Section 1.05.

EXAMPLE: 100 lin.ft. of 1/2" pipe and 100 lin.ft. of 6" pipe, including elbows, tees. Flanges, etc.

$$100 \times 0.65 = 65 \text{ sq.ft.} \quad 65 \times \text{unit price} = \text{Payment}$$

$$100 \times 2.62 = 262 \text{ sq.ft.} \quad 262 \times \text{unit price} = \text{Payment}$$

- B. **REMOVAL, DISPOSAL AND REPLACEMENT OF BOILER INSULATION:** (all types including Silicate Block and including the removal/replacement of metal jacketing) Payment shall be made at 1.5 times the unit price per square foot.

EXAMPLE: Item B. removal and replacement of 1000 S.F. of boiler insulation (incl. Silicate block)

$$1000 \text{ S.F.} \times (1.5) \times \text{the Unit Price} = \text{Payment}$$

- C. **REMOVAL, DISPOSAL AND REPLACEMENT OF TANK INSULATION:** (all types including removal/replacement of metal jacketing) Payment shall be made at 1.5 times the unit price per square foot.

- D. **REMOVAL, DISPOSAL AND REPLACEMENT OF BOILER UPTAKE, & BREACHING INSULATION:** (all types including stiffening angles and wire lath) Payment shall be made at 2.0 times the unit price per square foot.

- E. **REMOVAL, DISPOSAL AND REPLACEMENT OF DUCT INSULATION:** Payment shall be made at 1.0 times the unit price per square foot.

- F. **REMOVAL, DISPOSAL AND REPLACEMENT OF SOFT ASBESTOS CONTAINING MATERIAL:** (Including sprayed-on fire proofing and sound proofing) Payment shall be made at 1.0 times the unit price per square foot of surface area. Area of irregular surfaces must be calculated and confirmed with DDC representative.

- G. **ACOUSTIC PLASTER REPAIR AND/OR ENCAPSULATION:** Payment shall be made at 0.5 times the unit price per square foot.

- H. **PATCHING OR REPAIR** of items listed in A through F will be paid at 0.33 times the unit price per square foot.

- I. **REMOVAL, DISPOSAL AND REPLACEMENT OF WATERPROOFING ASBESTOS CONTAINING MATERIAL:** (including friable and non-friable waterproofing material from interior and exterior walls, floors, foundations, penetrations, louvers, vents and openings other than windows, doors and skylights) Payment shall be made at 0.5 times the unit price per square foot.
- J. **REMOVAL, DISPOSAL AND REPLACEMENT OF ASBESTOS CONTAINING ELECTRICAL WIRING INSULATION:** (including friable and non-friable wiring insulation) Payment shall be made at 0.33 times the unit price per square foot.
- K. **PAINTING:** Payment shall be made at 0.05 times the unit price per square foot.
- L. **REMOVAL AND DISPOSAL OF ASBESTOS-CONTAINING PLASTER:** from ceilings and walls, including any wire lath and disposal as asbestos containing waste. Payment shall be made at 0.80 times the unit price per square foot.
- M. **REMOVAL AND DISPOSAL OF ASBESTOS-CONTAINING FLOOR TILES, CEILING TILES, TRANSITE PANELS:** (including any adhesive, glue, mastic and/or underlayment) and disposal as asbestos containing waste. Payment shall be made at 0.40 times the unit price per square foot. If multiple layers are discovered, each additional layer shall be paid at 0.20 times the unit price per square foot.
- N. **ADDITIONAL CLEAN UP/HOUSEKEEPING OF WORK AREA:** (excluding pre-cleaning of work area required by regulations) HEPA vacuuming and wet cleaning of asbestos contaminated surface. Payment shall be made at 0.20 times the unit price per square foot. When GLOVE BAG is employed to remove ACM, cost of HEPA vacuuming and wet cleaning of floor area up to 3 feet on each side of glove-bag shall be included in unit price and no extra payment will be made.
- O. **REMOVAL, DISPOSAL OF ASBESTOS-CONTAINING ROOFING MATERIAL:** including mastic, flashing and sealant compound and provide temporary asbestos-free roof covering consisting of one layer of rolled roofing paper sealed with asphaltic roofing compound. Payment shall be made at 0.8 times the unit price per square foot. Credit at a rate of 0.33 times the unit price will be taken for each square foot of temporary roof covering which the Asbestos abatement contractor is directed not to install.
- P. **PICK-UP AND DISPOSAL OF GROSS DEBRIS:** (excluding any waste generated from abatement under Item A-R) at a rate of \$150 per cubic yard for asbestos contaminated waste and \$75 per cubic yard for non-asbestos contaminated waste. This cost includes all labor and material cost associated with work.

- Q. **REMOVAL OF ASBESTOS-CONTAINING BRICK, BLOCK, MORTAR, CEMENT OR CONCRETE:** along with all surfacing materials including wire lath and/or other supporting structures and disposal as ACM waste. Payment shall be made at a rate of \$25.00 per cubic foot of material removed.
- R. **REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING WINDOW/DOOR CAULKING:** including friable and non-friable caulking, weather-stripping, glazing, sealants or other waterproofing materials applied to windows, doors, skylights, etc. Payment shall be made at the rate of \$400.00 per opening regardless of size or configuration. This cost includes labor, consumable materials, set-up/breakdown, removal and disposal, as required.

Note 1: CREDIT: For items listed in A through F, a credit at a rate of 0.33 times the unit price, times the respective multiplier (for each item) will be taken for each square foot of insulation which the asbestos abatement contractor is not directed to reapply.

Note 2: MINIMUM PAYMENT: The minimum payment per call at any individual job sites or various job sites during the same day will be eight hundred dollars (\$800.00).

Note 3: All payments shall be made as described in paragraph 1.09 herein.

Note 4: WORKING HIGHER THAN 12 FEET ABOVE FLOOR LEVEL OR WORK REQUIRING COMPLEX SCAFFOLDING OR CONSTRUCTION WORK PLATFORMS: Provisions are made in this Contract to compensate the Asbestos abatement contractor for work performed in locations that are difficult to access due to work at elevations that are significantly higher than the normal work level. The unit price for these items will be paid at 1.20 times the unit price described in Paragraphs 1.09, A through R for those portions of the work that are more than twelve (12) feet above the grade for that would be judged as the normal working level.

1.10 GUARANTEE

- A. Work performed in compliance with each task shall be guaranteed for a period of one year from the date the completed work is accepted by the Department of Design and Construction.
- B. The Commissioner of The Department of Design and Construction will notify the Asbestos abatement contractor in writing regarding defects in work under the guarantee.

1.11 OCCUPANCY OF SITE NOT EXCLUSIVE

Attention is specifically drawn to the fact that contractors, performing the work of other Contracts, may be brought upon any of the work sites of this Contract. Therefore, the Asbestos abatement contractor shall not have exclusive rights to any site of his work and shall fully cooperate and coordinate his work with the work of other contractors who may

be brought upon any site of the work of this Contract. This paragraph applies to those areas outside the regulated Work Area as defined by Title 15, Chapter I of RCNY.

1.12 SUBMITTALS

A. Pre-Construction Submittals:

1. Attend a pre-construction meeting scheduled by the City of New York Department of Design and Construction. This meeting shall also be attended by a designated representative of the City of New York third party air monitoring firm, facility manager and the Construction Project Manager. At this meeting, the Asbestos abatement contractor shall present three copies of the following items:
 - a. Asbestos abatement contractor's scope of work, work plan and schedule.
 - b. Asbestos project notifications, approved variances and plans to Government Agencies.
 - c. Copies of Permits, clearance and licenses if required.
 - d. Schedules: the Asbestos abatement contractor shall provide to the Construction Project Manager a copy of the following schedules for approval. Once approved, schedules shall be maintained and updated as received. Asbestos abatement contractor shall post a copy of all schedules at the site:
 - (1) A construction schedule stating critical dates of the project including, but not limited to, mobilization, Work Area preparation, demolition, gross removal, fine cleaning, encapsulation, inspections, clearance monitoring, and phase of refinishing and final inspections. The schedule shall be updated biweekly, at a minimum.
 - (2) A schedule of staffing stating number of workers per shift per activity, name and number of supervisor(s) per shift, shifts per day, and total days to be worked.
 - (3) Submit all changes in schedule or staffing to the Construction Project Manager prior to implementation.
 - e. Written description of emergency procedures to be followed in case of injury or fire. This section must include evacuation procedures, source of medical assistance (name and telephone number to nearest

hospital) and procedures to be used for access by medical personnel (examples: first aid squad and physician). NOTE: Necessary Emergency Procedures Shall Take Priority Over All Other Requirements of These Specifications.

- f. Material Safety Data Sheets (MSDS) for encapsulants, sealants, firestopping foam, cleaners/disinfectants, spray adhesive and any and all potentially hazardous materials that may be employed on the project. No work involving the aforementioned will be allowed to proceed until MSDS are reviewed.
- g. Worker Training and Medical Surveillance: The Asbestos abatement contractor shall submit a list of the persons who will be employed by him /her to perform the removal work. Present evidence that workers have received proper training required by the regulations and the medical examinations required by OSHA 29 CFR 1926.1101.
- h. Logs: Specimen copies of daily progress log, visitor's log, and disposal log.
 - (1) The Asbestos abatement contractor shall provide a permanently bound log book of minimum 8-1/2" x 11" size at the entrance to the Worker and Waste Decontamination enclosure system as hereinafter specified. Log book shall contain on title page the project name, name, address and phone number of the Asbestos abatement contractor; name, address and phone number of Asbestos abatement contractor and City's third party air monitoring firm; emergency numbers including, but not limited to local Fire/Rescue Department. Log book shall contain a list of personnel approved for entry into the Work Area.
 - (2) All entries into the log shall be made in non-washable, permanent ink and such pen shall be strung to or otherwise attached to the log to prevent removal from the log-in area. Under no circumstances shall pencil entries be permitted. Any significant events occurring during the abatement project shall be entered into the log. Upon completion of the job, the Asbestos abatement contractor shall submit the logbook containing a day-to-day record of personnel log entries countersigned by the Construction Project Manager every day.
- i. Worker's Acknowledgments: Submit statements signed by each employee that the employee has received training in the proper handling of ACM, understands the health implications and risks

involved; and understands the use and limitations of the respiratory equipment to be used.

B. During Construction Submittals:

1. Security and safety logs showing names of person entering workspace, date and time of entry and exit, record of any accident, emergency evacuation, and any other safety and/or health incident.
2. Progress logs showing the number of workers, supervisors, hours of work and tasks completed shall be submitted daily to the Construction Project Manager.
3. Floor plans indicating Asbestos abatement contractor's current work progress shall be submitted for review by the Construction Project Manager.
4. All Asbestos abatement contractors' air monitoring and inspection results.

C. Project Closeout Submittals:

Upon completion of the project and as a condition of acceptance, the Asbestos abatement contractor shall present two copies of the following items, bound and indexed:

1. Lien Waivers from Asbestos abatement contractor, Sub-Asbestos abatement contractors and Suppliers,
2. Daily OSHA air monitoring results,
3. All Waste Manifests (Asbestos and Construction Debris), seals and disposal logs,
4. Field Sign-In/Sign-Out Logs for every shift,
5. Copies of all Building Department Forms and Permits,
6. A Letter of Compliance stating that all the work on this project was performed in accordance with the Specifications and all applicable Federal, State and Local regulations,
7. All Warranties as stated in the Specifications,
 - a. Fully executed disposal certificates and transportation manifest.
8. Project Record: The Asbestos abatement contractor shall maintain a project record for all small and large asbestos projects. During the project, the

project record shall be kept on site at all times. Upon completion of the project, the project record shall be maintained by the building owner. The project record shall be submitted to DDC as part of the close out documents. The project record shall consist of:

- a. Copies of licenses of all asbestos abatement contractors involved in the project;
- b. Copies of NYCDEP and NYSDOL supervisor and handler certificates for all workers engaged in the project;
- c. Copies of all project notifications and reports filed with NYCDEP, NYSDOL and USEPA for the project, with any amendments or variances;
- d. Copies of all asbestos abatement permits, including associated approved plans and work place safety plan;
- e. A copy of the air sampling log and all air sampling results;
- f. A copy of the abatement asbestos abatement contractor's daily log book;
- g. Copies of all asbestos waste manifests;
- h. A copy of all Project Monitor's Reports (ACP-15).
- i. A copy of each ATR-1 Form completed for the asbestos project (if required).
- j. A copy of each Asbestos Project Conditional Closeout Report (ACP-20) if required.
- k. A copy of the Asbestos Project Completion Form (ACP-21).

1.13 PROTECTION OF FURNITURE AND EQUIPMENT

Cover all furniture and equipment that cannot be removed from Work Areas. Movable furniture and equipment will be removed from Work Areas by the Asbestos abatement contractor prior to start of work. At the conclusion of the work (after final air testing), the Asbestos abatement contractor will remove all plastic covering on walls, floors, furniture, equipment and reinstall furniture and equipment. He shall remove and store all sheaths, curtains and drapes, and reinstall same following final clean up.

1.14 UTILITIES

A. General:

All temporary facilities shall be subject to the approval of the Commissioner. Prior to starting work at any site, locations and/or sketches (if required) of temporary facilities must be submitted to the Construction Project Manager for the required approval.

B. Water:

The Department of Design and Construction will furnish all water needed for construction, at no cost to the Asbestos abatement contractor in buildings under their jurisdiction. However, it is the responsibility of the Asbestos abatement contractor to ensure that hot water is provided for showering in the decontamination unit. The Asbestos abatement contractor shall furnish, install and maintain any needed equipment to meet these requirements at his own expense.

C. Electricity:

The Department of Design and Construction will furnish all electricity needed for construction, at no cost to the Asbestos abatement contractor in a building, under their jurisdiction. The Asbestos abatement contractor is responsible for routing the electric power to the abatement Work Area.

All temporary lighting and temporary electrical service for Work Area shall be in weatherproof enclosures and be ground fault protected.

- D. In leased spaces, arrangements for water supplies and electricity must be made with the landlord. However, all such arrangements must be made through and are subject to approval of the Department of Design and Construction. Utilities will be provided at no cost to the Asbestos abatement contractor. However, it is the Asbestos abatement contractor's (or the HVAC contractor's) responsibility to furnish and install a suitable distribution system to the Work Area. This system will be provided at no cost to the City.

1.15 FEES

The Asbestos abatement contractor shall be responsible for any and all fees or charges imposed by Local, State or Federal Law, Rule and Regulation applicable to the work specified herein, including fees or charges which may be imposed subsequent to the date of the Bid opening.

END OF SECTION

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SECTION 23 05 00 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Provide commissioning as per third party commissioning agent requirements. Refer to commissioning specification for requirements.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Transition fittings.
 - 3. Dielectric fittings.
 - 4. Mechanical sleeve seals.
 - 5. Sleeves.
 - 6. Escutcheons.
 - 7. Grout.
 - 8. HVAC demolition.
 - 9. Equipment installation requirements common to equipment sections.
 - 10. Painting and finishing.
 - 11. Concrete bases.
 - 12. Supports and anchorages.

1.3 DEFINITIONS

- A. **Finished Spaces:** Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. **Exposed, Interior Installations:** Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. **Exposed, Exterior Installations:** Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. **Concealed, Interior Installations:** Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
- E. **Concealed, Exterior Installations:** Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
 - 1. PP: Polypropylene plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Escutcheons.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

- D. Provide color coordination drawings showing all Division 21, 22, 23, 26, and 27 trades on the same drawing. Each trade should be in a separate color. Coordinated multi-trade shop drawings showing the work of all Divisions/trades installing pipes, conduits, ducts, or other items shall be created. The process of creating these drawings shall be developed and managed by the Construction Manager. These drawings shall use the architectural plans as backgrounds. Scale shall be 3/8" = 1'-0". The coordination process and drawing production shall be led by the Division 23 contractor. Drawings shall be provided to the other trades for their use by the Division 23 contractor. Show invert levels for all gravity piping at key points to show that clearance is achieved.

1.8 REGULATIONS, CODES, PERMITS AND FEES

A. General

1. The installation shall be in accordance with all relevant codes and regulations of the City and State having jurisdiction over the project location.
2. Codes, standards and specifications applicable to this work shall be the latest editions in effect at the date of the proposal.
3. It is not the intent of Drawings and Specifications to repeat requirements of codes except where necessary for completeness or clarity.
4. Nothing in the Drawings or Specifications shall be construed to permit Work not conforming to applicable laws, ordinances, rules or regulations.
5. When the Documents conflict with regulatory or code requirements the most stringent requirement shall apply.
6. Contractor shall be responsible for all law violations caused by the work under this Division. Notify the Commissioner in writing when a discrepancy occurs between code requirements and work shown on drawings and resolve the discrepancy before proceeding with work.

B. Inspections and Approvals

1. Provide the Commissioner, the Construction Manager and local Inspectors access to work at all times.
2. All special inspections shall be the responsibility of the City of New York. The City of New York shall coordinate all inspections and provide all support and personnel necessary for successful completion.

C. Permits and Fees

1. Make application and pay for all certificates of inspection, taxes and permits required by AHJs. Deliver to the Commissioner any and all certificates of inspections, permits, and approvals which may be required by AHJs.
2. Pay all utility charges and charges from the AHJ for providing temporary and permanent water, sewer, and gas services to buildings.

1.9 REVIEW OF CONSTRUCTION

- A. Work may be reviewed at any time by Commissioner.
- B. Advise Commissioner that work is ready for review at following times:
1. Prior to backfilling buried work.
 2. Prior to concealment of work in walls and above ceilings.

3. When an area or section of work is ready for punchlisting by the Commissioner.
 4. When all requirements of Contract have been completed.
- C. Do not backfill or conceal work without Commissioner's consent.
- D. Maintain at the job site a set of Specifications and Drawings for use by Commissioner.
- E. Commissioner's reviews will be periodic, depending upon nature of construction. Commissioner is not required to perform extensive or continuous inspection, is not responsible for execution of Contract Documents by Contractor and is not responsible for construction methods, sequences, or safety precautions.

1.10 MINOR DEVIATION

- A. The dimensions and ratings of equipment herein specified or indicated on the Drawings are intended to establish the desired outlines and characteristics of such equipment. Minor deviations may be permitted after review by the Commissioner to allow manufacturers specified to bid on their nearest standard equipment.
- B. Manufacturers catalog or model numbers and types mentioned in the Specifications or indicated on the drawings are intended to be used as guides and shall not be interpreted as taking precedence over specific ratings or duty called for or shown, which modify stipulations in such catalogs. In all cases, the manufacturer shall verify the duty specified with the particular characteristics of the equipment he intends to submit and shall only submit items that comply with Specification requirements.

1.11 DEFECTIVE WORK

- A. Defective work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or other cause shall be removed within ten (10) days after written notice is given by the Commissioner and the work shall be re-executed by the Contractor.
- B. The fact that the defects may have previously been overlooked by the Commissioner shall not constitute total or partial acceptance or grounds for additional payment for corrective work.

1.12 COOPERATION BETWEEN TRADES

- A. General
1. Cooperate with all other Divisions performing work on this project as necessary to achieve a complete neatly fitted installation for each condition. Consult the Drawings and Specifications to determine nature and extent of work specified in other Divisions which adjoins or attaches to the work of this Division. Confer with other Divisions at the site to coordinate this work with theirs in view of job conditions to the end that interferences may be eliminated and that maximum head room and clearance may be obtained. In the event that interferences develop, the Commissioner's decision will be final as to which Division shall relocate its work and no additional compensation will be allowed for the moving of piping, ductwork, conduit or equipment to clear such interferences.
 2. Provide templates, information and instructions to other divisions to properly locate holes and openings to be cut or provide.
 3. For Testing and Balancing of the system, ensure full co-ordination between the Testing and Balancing subcontractor and all other Trades to achieve access to all system components including leaving wall/ceiling sections down for access.

4. Ensure full co-ordination between controls subcontractor and Testing and Balancing subcontractor to ensure the system is commissioned in accordance with the requirements of the contract documents.
- B. The Contractor shall be responsible for the coordination of the mechanical ducting and piping distribution with the lighting, conduit, cable tray and structural members.
- C. Electrical work for mechanical equipment.
1. It is the Division 23 Contractor's responsibility to ensure the Division 26 Contractor is aware of the electrical power and control requirements of all mechanical equipment.
 2. Electrical Work in this Division shall conform to requirements of Division 26.
 3. Work and equipment specified in Division 26 and to be completed by the Division 26 Contractor:
 - a. Motors except motors packaged with a piece of equipment
 - b. Motor control centers.
 - c. Motor starters except starters packaged with a piece of equipment.
 - d. Disconnect switches except disconnect switches packaged with or factory mounted to a piece of equipment.
 - e. Power wiring to all equipment including from equipment disconnect switches to motors.
 - f. Power wiring to all components of equipment that are not factory pre-wired including but not limited to solenoid valves and relays.
 - g. Power wiring to all control panels.
 - h. Hard wired interlocks between the BMS and all other electrical systems including but not limited to fire alarm, security and information technology systems.
 - i. Conduit for the controls system wiring specified in Division 23.
 - j. Wiring for the fire protection system.
 - k. Smoke detectors for mounting in the Division 23 system and wiring to the smoke detectors. The smoke detectors will be mounted by the Division 23 contractor. Smoke detectors shall be located according to manufacturer's installation requirements and locations shall be shown on the mechanical shop drawings.
 4. Work specified in this Division and to be completed by the Division 23 contractor:
 - a. Supply of complete and accurate wiring diagrams to Division 26 for all equipment requiring electrical power wiring.
 - b. Adjustable motor bases and all bolts and nuts required for installation of base and motor.
 - c. Alignment and adjustment of mechanical couplings for direct-driven motorized equipment and of drive and belt tension on belt driven equipment.
 - d. Field lubrication of all motors prior to operation and up to time of acceptance of equipment by the Commissioner.
 - e. Motor terminal connection diagram as prepared by motor manufacturers.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

- A. Refer to individual Division 23 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
1. Manufacturers:
 - a. Capitol Manufacturing Co.
 - b. Central Plastics Company.
 - c. Epco Sales, Inc.
 - d. Watts Industries, Inc.; Water Products Div.
- D. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
1. Manufacturers:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Central Plastics Company.
 - d. Pipeline Seal and Insulator, Inc.
 2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.
- E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
1. Manufacturers:
 - a. Calpico, Inc.
 - b. Lochinvar Corp.
- F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.
1. Manufacturers:
 - a. Perfection Corp.
 - b. Precision Plumbing Products, Inc.
 - c. Sioux Chief Manufacturing Co., Inc.
 - d. Victaulic Co. of America.

2.5 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc.
2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Plastic. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.6 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 1. Underdeck Clamp: Clamping ring with set screws.
- E. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.
- F. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- G. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- H. One-Piece, Cast-Brass Type: With set screw.
 1. Finish: Polished chrome-plated
- I. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
 1. Finish: Polished chrome-plated
- J. One-Piece, Floor-Plate Type: Cast-iron floor plate.
- K. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.7 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 2. Design Mix: 5000-psi, 28-day compressive strength.
 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
1. New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type with spring clips.

- d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - g. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
 - h. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
2. Existing Piping: Use the following:
 - a. Chrome-Plated Piping: Split-casting, cast-brass type with chrome-plated finish.
 - b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge and spring clips.
 - c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
 - d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
 - e. Bare Piping in Unfinished Service Spaces: Split-casting, cast-brass type with polished chrome-plated finish.
 - f. Bare Piping in Equipment Rooms: Split-casting, cast-brass type.
 - g. Bare Piping at Floor Penetrations in Equipment Rooms: Split-casting, floor-plate type.
- M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas, all areas with waterproofing applied to floor, or any other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
 3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - a. Steel Pipe Sleeves: For pipes smaller than NPS 6 (DN 150).
 - b. Steel Sheet Sleeves: For pipes NPS 6 (DN 150) and larger, penetrating gypsum-board partitions.
 - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
 - 1) Seal space outside of sleeve fittings with grout.
 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

- N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Install steel pipe for sleeves smaller than 6 inches in diameter.
 2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
 3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.
- Q. Verify final equipment locations for roughing-in.
- R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
 - H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
 - I. PP Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
 1. Plain-End Pipe and Fittings: Use butt fusion.
 2. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.3 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
 2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.5 PAINTING

- A. Painting of HVAC systems, equipment, and components is specified in Division 09 Section "Painting."
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.6 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
 - 1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
 - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
 - 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
 - 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
 - 7. Use 4100-psi 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete"

3.7 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

3.8 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor HVAC materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

3.9 GROUTING

- A. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.

- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION 23 05 00

SECTION 23 05 13 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.
- B. Comply with NEMA MG 1 unless otherwise indicated.
- C. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 104 deg C and at altitude of 3300 feet above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Premium, as defined in NEMA MG 1.
- C. Service Factor: 1.15.

- D. Multispeed Motors: Variable torque.
 - 1. For motors with 2:1 speed ratio, consequent pole, single winding.
 - 2. For motors with other than 2:1 speed ratio, separate winding for each speed.
- E. Multispeed Motors: Separate winding for each speed.
- F. Rotor: Random-wound, squirrel cage.
- G. Bearings: Double-shielded, prelubricated ball bearings suitable for radial and thrust loading.
- H. Temperature Rise: Match insulation rating.
- I. Insulation: Class F.
- J. Code Letter Designation:
 - 1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
 - 2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.
- K. Enclosure Material: Cast iron for motors 7.5 hp and larger; rolled steel for motors smaller than 7.5 hp.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

- A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
- B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
 - 1. Designed with critical vibration frequencies outside operating range of controller output.
 - 2. Temperature Rise: Matched to rating for Class B insulation.
 - 3. Insulation: Class H.
 - 4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
- C. Source Quality Control for Field-Installed Motors: Perform the following tests on each motor according to NEMA MG 1:
 - 1. Measure winding resistance.
 - 2. Read no-load current and speed at rated voltage and frequency.
 - 3. Measure locked rotor current at rated frequency.
 - 4. Perform high-potential test.

2.5 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent-split capacitor.
 - 2. Split phase.
 - 3. Capacitor start, capacitor run.

- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- D. Motors 1/20 HP and Smaller: Shaded-pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 23 05 13

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SECTION 23 05 19 - METERS AND GAGES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Thermometers.
- 2. Gages.
- 3. Test plugs.

1.3 DEFINITIONS

- A. CR: Chlorosulfonated polyethylene synthetic rubber.
- B. EPDM: Ethylene-propylene-diene terpolymer rubber.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated; include performance curves.
- B. Shop Drawings: Schedule for thermometers and gages indicating manufacturer's number, scale range, and location for each.
- C. Product Certificates: For each type of thermometer and gage, signed by product manufacturer.

PART 2 - PRODUCTS

2.1 STAINLESS STEEL-CASE, ADJUSTABLE DIAL-TYPE THERMOMETERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Terice, H. O. Co.
 - 2. Ashcroft Commercial Instrument Operations; Dresser Industries; Instrument Div.
 - 3. Weiss Instruments, Inc.
- B. All Stainless Steel Construction.
- C. External Recalibration Adjustment.
- D. White dial with black markings.
- E. Accurate to $\pm 1\%$ of Scale Range.
- F. Gasketed Glass Face.

- G. Case is sealed to exclude dirt, dust and moisture.
- H. 5" dial size.
- I. Angularly adjustable frame permits positioning of dial to accommodate viewing requirements.
- J. For thermometers and wells through insulation, provide extensions to compensate for insulation thickness.

2.2 THERMOWELLS

- A. Manufacturers: Same as manufacturer of thermometer being used.
- B. Description: Pressure-tight to match piping system design pressure, socket-type stainless steel fitting made for insertion into piping and of type, diameter, and length required to hold thermometer. Provide extension for insulated piping. Provide cap nut with chain fastened permanently to the thermometer well.

2.3 PRESSURE GAGES

- A. Manufacturers: Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Trerice, H. O. Co.
 - 2. Ashcroft Commercial Instrument Operations; Dresser Industries; Instrument Div.
 - 3. Weiss Instruments, Inc.
- B. Direct-Mounting, Dial-Type Pressure Gages: Indicating-dial type complying with ASME B40.100.
 - 1. Case: Dry type, drawn steel, 4-1/2-inch diameter.
 - 2. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.
 - 3. Pressure Connection: Brass, NPS 1/4 (DN 8), bottom-outlet type unless back-outlet type is indicated.
 - 4. Movement: Mechanical, with link to pressure element and connection to pointer.
 - 5. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.
 - 6. Pointer: Dark-color metal.
 - 7. Window: Glass.
 - 8. Ring: Brass or Stainless steel.
 - 9. Accuracy: Grade A, ± 1 percent of middle half scale.
 - 10. Vacuum-Pressure Range: 30-in. Hg of vacuum to 15 psig of pressure.
 - 11. Range for Fluids under Pressure: Two times operating pressure.
- C. Remote-Mounting, Dial-Type Pressure Gages: ASME B40.100, indicating-dial type.
 - 1. Case: Dry type, drawn steel 4-1/2-inch diameter with holes for panel mounting.
 - 2. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.
 - 3. Pressure Connection: Brass, NPS 1/4 (DN 8), bottom-outlet type unless back-outlet type is indicated.
 - 4. Movement: Mechanical, with link to pressure element and connection to pointer.
 - 5. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.
 - 6. Pointer Dark-color metal.
 - 7. Window: Glass.
 - 8. Ring: Brass or Stainless steel.

9. Accuracy: Grade A, plus or minus 1 percent of middle half scale.
10. Vacuum-Pressure Range: 30-in. Hg of vacuum to 15 psig of pressure.
11. Range for Fluids under Pressure: Two times operating pressure.

D. Pressure-Gage Fittings:

1. Valves: NPS 1/4 (DN 8) brass or stainless-steel needle type.
2. Syphons: NPS 1/4 (DN 8) coil of brass tubing with threaded ends.
3. Snubbers: ASME B40.5, NPS 1/4 (DN 8) brass bushing with corrosion-resistant, porous-metal disc of material suitable for system fluid and working pressure.

2.4 TEST PLUGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Peterson Equipment Co., Inc.
2. Trerice, H. O. Co.
3. Watts Industries, Inc.; Water Products Div.

B. Description: Corrosion-resistant brass or stainless-steel body with core inserts and gasketed and threaded cap, with extended stem for units to be installed in insulated piping. Model 110/100XL with yellow cap. Locate where required for balancing and where indicated on Drawings. Coordinate with balancing firm.

C. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

D. Core Inserts: One or two self-sealing rubber valves.

1. Insert material shall be Nordel.

E. Test Kit: Furnish one test kit(s) containing one pressure gage and adaptor, one thermometer, and carrying case. Pressure gage, adapter probes, and thermometer sensing elements shall be of diameter to fit test plugs and of length to project into piping.

1. Pressure Gage: Small bourdon-tube insertion type with 3-inch diameter dial and probe. Dial range shall be 0 to 200 psig.
2. High-Range Thermometer: Small bimetallic insertion type with 2-inch diameter dial and tapered-end sensing element. Dial ranges shall be 0 to 220 deg F.
3. Carrying case shall have formed instrument padding.

PART 3 - EXECUTION

3.1 THERMOMETER APPLICATIONS

A. Install liquid-in-glass thermometers in the following locations and as shown on drawings:

1. Inlet and outlet of each hydronic zone.
2. Inlet and outlet of each hydronic coil in air-handling units and built-up central systems.
3. Inlet and outlet of each hydronic heat exchanger.
4. Inlet and outlet of each hydronic heat-recovery unit.
5. Inlet and outlet of each thermal storage tank.

- B. Install liquid-filled case-type, vapor-actuated dial thermometers at suction and discharge of each pump.
 - C. Provide the following temperature ranges for thermometers:
 - 1. Heating Hot Water: 30 to 240 deg F, with 2-degree scale divisions.
 - 2. Chilled Water: 0 to 100 deg F, with 2-degree scale divisions.
- 3.2 PRESSURE-GAGE SCALE-RANGE SCHEDULE
- A. Scale Range for Chilled-Water Piping: 0 to 160 psi.
 - B. Scale Range for Heating, Hot-Water Piping: 0 to 160 psi.
- 3.3 GAGE APPLICATIONS
- A. Install dry-case-type pressure gages at chilled- and condenser-water inlets and outlets of chillers.
 - B. Install dry-case-type pressure gages at suction and discharge of each pump.
 - C. Install additional pressure gages as identified on drawings.
- 3.4 INSTALLATIONS
- A. Install direct-mounting thermometers and adjust vertical and tilted positions.
 - B. Install thermowells with socket extending to center of pipe and in vertical position in piping tees where thermometers are indicated.
 - C. Duct Thermometer Support Flanges: Install in wall of duct where duct thermometers are indicated. Attach to duct with screws.
 - D. Install direct-mounting pressure gages in piping tees with pressure gage located on pipe at most readable position.
 - E. Install needle-valve and snubber fitting in piping for each pressure gage for fluids.
 - F. Install test plugs in tees in piping.
 - G. Install flow indicators, in accessible positions for easy viewing, in piping systems.
 - H. Assemble and install connections, tubing, and accessories between flow-measuring elements and flowmeters as prescribed by manufacturer's written instructions.
 - I. Install flowmeter elements in accessible positions in piping systems.
 - J. Install differential-pressure-type flowmeter elements with at least minimum straight lengths of pipe upstream and downstream from element as prescribed by manufacturer's written instructions.
 - K. Install wafer-orifice flowmeter elements between pipe flanges.
 - L. Install permanent indicators on walls or brackets in accessible and readable positions.

- M. Install connection fittings for attachment to portable indicators in accessible locations.
- N. Install flowmeters at discharge of hydronic system pumps and at inlet of hydronic air coils.
- O. Assemble components and install thermal-energy meters.
- P. Mount meters on wall if accessible; if not, provide brackets to support meters.

3.5 CONNECTIONS

- A. Install meters and gages adjacent to machines and equipment to allow service and maintenance for meters, gages, machines, and equipment.
- B. Connect flowmeter-system elements to meters.
- C. Connect flowmeter transmitters to meters.
- D. Connect thermal-energy-meter transmitters to meters.

3.6 ADJUSTING

- A. Calibrate meters according to manufacturer's written instructions, after installation.
- B. Adjust faces of meters and gages to proper angle for best visibility.

END OF SECTION 23 05 19

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SECTION 23 05 23 - GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Bronze ball valves.
2. High-performance butterfly valves.
3. Bronze lift check valves.
4. Bronze swing check valves.
5. Iron swing check valves.
6. Iron, center-guided check valves.
7. Iron gate valves.
8. Bronze globe valves.
9. Iron globe valves.
10. Chainwheels.

- B. Related Sections:

1. Division 23 HVAC piping Sections for specialty valves applicable to those Sections only.
2. Division 23 Section "Identification for HVAC Piping and Equipment" for valve tags and schedules.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Nonrising stem.
- E. OS&Y: Outside screw and yoke.
- F. RS: Rising stem.

1.4 SUBMITTALS

- A. Product Data: For each type of valve indicated.

1.5 QUALITY ASSURANCE

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.1 for power piping valves.
3. ASME B31.9 for building services piping valves.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set angle, gate, and globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to HVAC valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 8 and larger.
2. Handwheel: For valves other than quarter-turn types.
3. Handlever: For quarter-turn valves NPS 6 and smaller.
4. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator; of size and with chain for mounting height, as indicated in the "Valve Installation" Article.

E. Valves in Insulated Piping: With minimum 2-inch (50-mm) stem extensions and the following features:

1. Gate Valves: With rising stem.

2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
3. Butterfly Valves: With extended neck.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Grooved: With grooves according to AWWA C606.
3. Solder Joint: With sockets according to ASME B16.18.
4. Threaded: With threads according to ASME B1.20.1.

G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE BALL VALVES

A. Two-Piece, Regular-Port, Bronze Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Conbraco Industries, Inc.; Apollo Valves model 70-100/200.
2. Description:
 - a. Standard: MSS SP-110.
 - b. CWP Rating: 600 psig.
 - c. Body Design: Two piece.
 - d. Body Material: Bronze.
 - e. Ends: Threaded.
 - f. Seats: PTFE or TFE.
 - g. Stem: Stainless steel.
 - h. Ball: Stainless steel, vented.
 - i. Port: Regular.

B. Three-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Conbraco Industries, Inc.; Apollo Valves model 82-100.
2. Description:
 - a. Standard: MSS SP-110.
 - b. CWP Rating: 600 psig.
 - c. Body Design: Three piece.
 - d. Body Material: Bronze.
 - e. Ends: Threaded.
 - f. Seats: PTFE or TFE.
 - g. Stem: Stainless steel.
 - h. Ball: Stainless steel, vented.
 - i. Port: Full.

2.3 HIGH-PERFORMANCE BUTTERFLY VALVES

A. Class 150, Single-Flange, High-Performance Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Jamesbury model 815L-11-22; a subsidiary of Metso Automation.
2. Description:
 - a. Standard: MSS SP-68.
 - b. CWP Rating: 285 psig at 100 deg F.
 - c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
 - d. Body Material: Carbon steel, cast iron, ductile iron, or stainless steel.
 - e. Seat: Reinforced PTFE or metal.
 - f. Stem: Stainless steel; offset from seat plane.
 - g. Disc: Carbon steel.
 - h. Service: Bidirectional.

B. Class 300, Single-Flange, High-Performance Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Jamesbury model 830L-11-22; a subsidiary of Metso Automation.
2. Description:
 - a. Standard: MSS SP-68.
 - b. CWP Rating: 720 psig at 100 deg F.
 - c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
 - d. Body Material: Carbon steel, cast iron, or ductile iron.
 - e. Seat: Reinforced PTFE or metal.
 - f. Stem: Stainless steel; offset from seat plane.
 - g. Disc: Carbon steel.
 - h. Service: Bidirectional.

2.4 BRONZE LIFT CHECK VALVES

A. Class 125, Lift Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
2. Description:
 - a. Standard: MSS SP-80, Type 1.

- b. CWP Rating: 200 psig.
- c. Body Design: Vertical flow.
- d. Body Material: ASTM B 61 or ASTM B 62, bronze.
- e. Ends: Threaded.
- f. Disc: Bronze.

2.5 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
- 2. Description:
 - a. Standard: MSS SP-80, Type 3.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B 62, bronze.
 - e. Ends: Threaded.
 - f. Disc: Bronze.

B. Class 150, Bronze Swing Check Valves with Bronze Disc:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
- 2. Description:
 - a. Standard: MSS SP-80, Type 3.
 - b. CWP Rating: 300 psig.
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B 62, bronze.
 - e. Ends: Threaded.
 - f. Disc: Bronze.

2.6 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Crane Co.; Crane Valve Group; Stockham Division.
 - d. Milwaukee Valve Company.
 - e. NIBCO INC.

2. Description:
 - a. Standard: MSS SP-71, Type I.
 - b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
 - c. NPS 14 to NPS 24, CWP Rating: 150 psig.
 - d. Body Design: Clear or full waterway.
 - e. Body Material: ASTM A 126, gray iron with bolted bonnet.
 - f. Ends: Flanged.
 - g. Trim: Bronze.
 - h. Gasket: Asbestos free.

2.7 IRON, CENTER-GUIDED CHECK VALVES

A. Class 125, Iron, Compact-Wafer, Center-Guided Check Valves with Metal Seat:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Milwaukee Valve Company.
 - b. Mueller Steam Specialty; a division of SPX Corporation.
 - c. NIBCO INC.

2. Description:

- a. Standard: MSS SP-125.
- b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
- c. NPS 14 to NPS 24, CWP Rating: 150 psig.
- d. Body Material: ASTM A 126, gray iron.
- e. Style: Compact wafer.
- f. Seat: Bronze.

2.8 IRON GATE VALVES

A. Class 125, NRS, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Milwaukee Valve Company.
 - c. NIBCO INC.

2. Description:

- a. Standard: MSS SP-70, Type I.
- b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
- c. NPS 14 to NPS 24, CWP Rating: 150 psig.
- d. Body Material: ASTM A 126, gray iron with bolted bonnet.
- e. Ends: Flanged.
- f. Trim: Bronze.
- g. Disc: Solid wedge.

h. Packing and Gasket: Asbestos free.

B. Class 125, OS&Y, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Crane Co.; Crane Valve Group; Crane Valves.
- b. Milwaukee Valve Company.
- c. NIBCO INC.

2. Description:

- a. Standard: MSS SP-70, Type I.
- b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
- c. NPS 14 to NPS 24, CWP Rating: 150 psig.
- d. Body Material: ASTM A 126, gray iron with bolted bonnet.
- e. Ends: Flanged.
- f. Trim: Bronze.
- g. Disc: Solid wedge.
- h. Packing and Gasket: Asbestos free.

C. Class 250, NRS, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Crane Co.; Crane Valve Group; Crane Valves.
- b. Crane Co.; Crane Valve Group; Stockham Division.
- c. NIBCO INC.

2. Description:

- a. Standard: MSS SP-70, Type I.
- b. NPS 2-1/2 to NPS 12, CWP Rating: 500 psig.
- c. NPS 14 to NPS 24, CWP Rating: 300 psig.
- d. Body Material: ASTM A 126, gray iron with bolted bonnet.
- e. Ends: Flanged.
- f. Trim: Bronze.
- g. Disc: Solid wedge.
- h. Packing and Gasket: Asbestos free.

D. Class 250, OS&Y, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Crane Co.; Crane Valve Group; Crane Valves.
- b. Milwaukee Valve Company.
- c. NIBCO INC.

2. Description:

- a. Standard: MSS SP-70, Type I.
- b. NPS 2-1/2 to NPS 12, CWP Rating: 500 psig.
- c. NPS 14 to NPS 24, CWP Rating: 300 psig.
- d. Body Material: ASTM A 126, gray iron with bolted bonnet.
- e. Ends: Flanged.
- f. Trim: Bronze.
- g. Disc: Solid wedge.
- h. Packing and Gasket: Asbestos free.

2.9 BRONZE GLOBE VALVES

A. Class 125, Bronze Globe Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Stockham Division.
 - c. NIBCO INC.
2. Description:
 - a. Standard: MSS SP-80, Type 2.
 - b. CWP Rating: 200 psig
 - c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
 - d. Ends: Threaded.
 - e. Stem: Bronze.
 - f. Disc: PTFE or TFE.
 - g. Packing: Asbestos free.
 - h. Handwheel: Malleable iron.

B. Class 150, Bronze Globe Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Milwaukee Valve Company.
 - c. NIBCO INC.
2. Description:
 - a. Standard: MSS SP-80, Type 2.
 - b. CWP Rating: 300 psig.
 - c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
 - d. Ends: Threaded.
 - e. Stem: Bronze.
 - f. Disc: PTFE or TFE.
 - g. Packing: Asbestos free.
 - h. Handwheel: Malleable iron

2.10 IRON GLOBE VALVES

A. Class 125, Iron Globe Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Milwaukee Valve Company.
 - c. NIBCO INC.
2. Description:
 - a. Standard: MSS SP-85, Type I.
 - b. CWP Rating: 200 psig.
 - c. Body Material: ASTM A 126, gray iron with bolted bonnet.
 - d. Ends: Flanged.
 - e. Trim: Bronze.
 - f. Packing and Gasket: Asbestos free.

B. Class 250, Iron Globe Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Milwaukee Valve Company.
 - c. NIBCO INC.
2. Description:
 - a. Standard: MSS SP-85, Type I.
 - b. CWP Rating: 500 psig.
 - c. Body Material: ASTM A 126, gray iron with bolted bonnet.
 - d. Ends: Flanged.
 - e. Trim: Bronze.
 - f. Packing and Gasket: Asbestos free.

2.11 CHAINWHEELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Babbitt Steam Specialty Co.
2. Roto Hammer Industries.
3. Trumbull Industries.

B. Description: Valve actuation assembly with sprocket rim, brackets, and chain.

1. Brackets: Type, number, size, and fasteners required to mount actuator on valve.

2. Attachment: For connection to butterfly valve stems.
3. Sprocket Rim with Chain Guides: Ductile or cast iron, of type and size required for valve. Include zinc coating.
4. Chain: Hot-dip, galvanized steel, of size required to fit sprocket rim.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install chainwheels on operators for butterfly valves more than 96 inches above floor. Extend chains to 60 inches above finished floor.
- F. Install check valves for proper direction of flow and as follows:
 1. Swing Check Valves: In horizontal position with hinge pin level.
 2. Lift Check Valves: With stem upright and plumb.

3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, butterfly valves.
2. Butterfly Valve Dead-End Service: Single-flange (lug) type.
3. Throttling Service: ball, or butterfly valves.
4. Pump-Discharge Check Valves:
 - a. NPS 2 and Smaller: Bronze swing check valves with bronze disc.
 - b. NPS 2-1/2 and Larger: Iron swing check valves with lever and weight or with spring or iron, center-guided, metal-seat check valves.

B. If valves with specified CWP ratings are not available, the same types of valves with higher CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
3. For Copper Tubing, NPS 5 and Larger: Flanged ends.
4. For Steel Piping, NPS 2 and Smaller: Threaded ends.
5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
6. For Steel Piping, NPS 5 and Larger: Flanged ends.

3.5 CHILLED-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Ball Valves: Two piece, regular port, bronze with stainless-steel trim.
2. Bronze Swing Check Valves: Class 125, bronze disc.

B. Pipe NPS 2-1/2 and Larger:

1. High-Performance Butterfly Valves: Class 150, single flange. Class 300 for building entrance valves. Gear operator for NPS 6 and larger.
2. Iron Swing Check Valves with Closure Control, NPS 2-1/2 to NPS 12: Class 125, lever and weight.

3.6 HEATING-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: Two piece, regular port, bronze with stainless-steel trim.
3. Bronze Swing Check Valves: Class 125, bronze disc.

B. Pipe NPS 2-1/2 and Larger:

1. High-Performance Butterfly Valves: Class 150, single flange. Gear operator for NPS 6 and larger.
2. Iron Swing Check Valves with Closure Control, NPS 2-1/2 to NPS 12: Class 125, lever and spring.

END OF SECTION 23 05 23

SECTION 23 05 29 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following hangers and supports for HVAC system piping and equipment:
 - 1. Steel pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Metal framing systems.
 - 4. Thermal-hanger shield inserts.
 - 5. Fastener systems.
 - 6. Pipe stands.
 - 7. Equipment supports.
- B. Related Sections include the following:
 - 1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
 - 2. Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment" for vibration isolation devices.
 - 3. Division 23 Section "Metal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society for the Valve and Fittings Industry Inc.
- B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel pipe hangers and supports.
 - 2. Thermal-hanger shield inserts.
 - 3. Powder-actuated fastener systems.

- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:
1. Trapeze pipe hangers. Include Product Data for components.
 2. Metal framing systems. Include Product Data for components.
 3. Pipe stands. Include Product Data for components.
 4. Equipment supports.
- C. Welding certificates.
- 1.6 QUALITY ASSURANCE
- A. Welding: Qualify procedures and personnel according to the following:
1. AWS D1.1, "Structural Welding Code--Steel."
 2. AWS D1.2, "Structural Welding Code--Aluminum."
 3. AWS D1.3, "Structural Welding Code--Sheet Steel."
 4. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
 5. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
- B. Manufacturers:
1. AAA Technology & Specialties Co., Inc.
 2. Bergen-Power Pipe Supports.
 3. B-Line Systems, Inc.; a division of Cooper Industries.
 4. Carpenter & Paterson, Inc.
 5. Empire Industries, Inc.
 6. ERICO/Michigan Hanger Co.
 7. Globe Pipe Hanger Products, Inc.
 8. Grinnell Corp.
 9. GS Metals Corp.
 10. National Pipe Hanger Corporation.
 11. PHD Manufacturing, Inc.
 12. PHS Industries, Inc.
 13. Piping Technology & Products, Inc.
 14. Tolco Inc.
- C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.
- E. Padded Hangers: Hanger with rubber or felt isolator for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, U-bolts, and padded hangers (rubber or felt isolator).

2.4 METAL FRAMING SYSTEMS

- A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

- B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. GS Metals Corp.
4. Power-Strut Div.; Tyco International, Ltd.
5. Thomas & Betts Corporation.
6. Tolco Inc.
7. Unistrut Corp.; Tyco International, Ltd.

- C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

- E. Padded Hangers: Hanger with rubber or felt isolator for support of bearing surface of piping.

2.5 THERMAL-HANGER SHIELD INSERTS

- A. Description: 100-psig minimum, compressive-strength insulation insert encased in sheet metal shield.

- B. Manufacturers:

1. Carpenter & Paterson, Inc.
2. ERICO/Michigan Hanger Co.
3. PHS Industries, Inc.
4. Pipe Shields, Inc.
5. Rilco Manufacturing Company, Inc.
6. Value Engineered Products, Inc.

- C. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with vapor barrier.

- D. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass.

- E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

- F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

- G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.6 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
1. Manufacturers:
 - a. Hilti, Inc.
 - b. ITW Ramset/Red Head.
 - c. Masterset Fastening Systems, Inc.
 - d. MKT Fastening, LLC.
 - e. Powers Fasteners.
- B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
1. Manufacturers:
 - a. B-Line Systems, Inc.; a division of Cooper Industries.
 - b. Empire Industries, Inc.
 - c. Hilti, Inc.
 - d. ITW Ramset/Red Head.
 - e. MKT Fastening, LLC.
 - f. Powers Fasteners.

2.7 PIPE STAND FABRICATION

- A. Pipe Stands, General: Shop or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Compact Pipe Stand: One-piece plastic unit with integral-rod-roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
1. Manufacturers:
 - a. ERICO/Michigan Hanger Co.
 - b. MIRO Industries.
- C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.
1. Manufacturers:
 - a. MIRO Industries.
- D. High-Type, Single-Pipe Stand: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
1. Manufacturers:
 - a. ERICO/Michigan Hanger Co.
 - b. MIRO Industries.
 - c. Portable Pipe Hangers.

2. Base: Stainless steel.
 3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
 4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.
- E. High-Type, Multiple-Pipe Stand: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
1. Manufacturers:
 - a. Portable Pipe Hangers.
 2. Bases: One or more plastic.
 3. Vertical Members: Two or more protective-coated-steel channels.
 4. Horizontal Member: Protective-coated-steel channel.
 5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.
- F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe support made from structural-steel shape, continuous-thread rods, and rollers for mounting on permanent stationary roof curb.

2.8 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.9 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
1. Properties: Nonstaining, noncorrosive, and nongaseous.
 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

- E. Use padded hangers for piping that is subject to scratching.
- F. Floor support hanger devices or systems shall not be used.
- G. Angle iron or Unistrut type wall brackets shall not be used.
- H. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F pipes, NPS 4 to NPS 16, requiring up to 4 inches of insulation.
 3. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24, if little or no insulation is required.
 4. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
 5. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange.
 6. Single Pipe Rolls: For suspension of pipes, NPS 1 to NPS 30, from 2 rods if longitudinal movement caused by expansion and contraction might occur.
 7. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 20, from single rod if horizontal movement caused by expansion and contraction might occur.
 8. Complete Pipe Rolls: For support of pipes, NPS 2 to NPS 42, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
 9. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, NPS 2 to NPS 24, if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
 10. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 to NPS 30, if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- I. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Provide all-directional, resiliently supported vertical riser piping support/suspension from structure. Single point of support desired. Multiple points of support acceptable, but must be engineered, complete with detailed installation and adjustment instructions by supplier. Resilient anchors to preclude direct contact of piping with structure, yet provide a neutral point for expansion/contraction of piping. Mason ADA or VSG.
 - a. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
 - b. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.
- J. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.

4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F installations.
- K. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 12. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
 15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- L. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- M. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
 2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.

3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
 4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
 5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.
 6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.
 7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from trapeze support.
 8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
 - a. Horizontal (MSS Type 54): Mounted horizontally.
 - b. Vertical (MSS Type 55): Mounted vertically.
 - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- N. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
- O. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.
- P. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

- A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.
1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
 2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
- D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- E. Fastener System Installation:
1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use

- operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- F. Pipe Stand Installation:
1. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
 2. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb.
- G. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- I. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- J. Install lateral bracing with pipe hangers and supports to prevent swaying.
- K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- L. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.
- N. Insulated Piping: Comply with the following:
1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation. Insulation to cover clamp.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.
 - d. Include piping isolators for clamps in direct contact with piping.
 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

- a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
 - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
 5. Pipes NPS 8 and Larger: Include wood inserts.
 6. Insert Material: Length at least as long as protective shield.
 7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.
 8. Provide all vibration isolation of piping per specification 230548 (Vibration and Seismic Controls for HVAC Piping & Equipment).

3.3 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make smooth bearing surface.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.6 PAINTING

- A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 23 05 29

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SECTION 23 05 48 - VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Isolation pads.
 - 2. Isolation mounts.
 - 3. Elastomeric hangers.
 - 4. Spring hangers.
 - 5. Pipe riser resilient supports.
 - 6. Restraining braces and cables.
 - 7. Steel vibration isolation equipment bases.

1.3 DEFINITIONS

- A. IBC: International Building Code.
- B. ICC-ES: ICC-Evaluation Service.

1.4 PERFORMANCE REQUIREMENTS

- A. Seismic-Restraint Loading:
 - 1. Site Class as Defined in the IBC: Soil Site Class D.
 - 2. Assigned Seismic Use Group or Building Category as Defined in the IBC: II
 - a. Component Importance Factor: 1.5 for all components related to life safety, 1.0 for all other components.
The component importance factor, I_p , shall be taken as 1.5 if any of the following conditions apply:
 - 1) The component is required to function for life-safety purposes after an earthquake, including fire protection systems.
 - 2) The component contains hazardous materials.
 - 3) The component is attached to an Occupancy Category IV structure (we are Category II) and it is needed for continued operation of the facility or its failure could impair the continued operation of the facility.
 - b. All other components shall be assigned a component importance factor of 1.0.
 - b. Component Response Modification Factor: 6.0
 - c. Component Amplification Factor: 2.5
 - 3. Design Spectral Response Acceleration at Short Periods (0.2 Second): 0.367g.
 - 4. Design Spectral Response Acceleration at 1-Second Period: 0.114g.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
 - a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
 - b. Annotate to indicate application of each product submitted and compliance with requirements.
3. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

B. Delegated-Design Submittal: For vibration isolation and seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic forces required to select vibration isolators, seismic restraints, and for designing vibration isolation bases.
 - a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Division 22 Sections for equipment mounted outdoors.
2. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system has been examined for excessive stress and that none will exist.
3. Vibration Isolation Base Details: Detail overall dimensions, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.
4. Seismic-Restraint Details:
 - a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
 - b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
 - c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Division 22 Sections for equipment mounted outdoors.
 - d. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

- C. Coordination Drawings: Show coordination of seismic bracing for HVAC piping and equipment with other systems and equipment in the vicinity, including other supports and seismic restraints.
- D. Welding certificates.
- E. Qualification Data: For professional engineer and testing agency.
- F. Field quality-control test reports.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
- B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are *more stringent*.
- C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. General:

1. Provide vibration isolators in accordance with the load distribution to produce uniform static deflection as specified on the schedule.
2. All metal parts of vibration isolation units installed out-of-doors shall be hot-dip galvanized, cadmium-plated, or neoprene-coated after fabrication. Galvanizing shall meet ASTM Salt Spray Test Standards and Federal Test Standard No. 14.
3. Isolator types are scheduled to establish minimum standards. At the Contractor's option, labor-saving accessories can be an integral part of isolators supplied to provide initial lift of equipment to operating height, hold piping at fixed elevations during installation and initial system filling operations, and similar installation advantages. Accessories must not degrade the vibration isolation system.
4. All static deflections stated are the minimum acceptable deflection for the vibration isolator under actual load as shown on the drawings. Isolators selected purely on the basis of rated deflection are not acceptable. Where static deflections are not specified, provide minimum 50mm static deflection for rotating and/or reciprocating equipment.
5. Where specific type of vibration isolation hardware equipment is not shown or specified, furnish isolators recommended by the isolation manufacturer compatible with equipment arrangement shown.

6. All vibration isolation mounts shall be supplied by one of the following manufacturers:

- a. Mason Industries Inc.
- b. Kinetics Noise Control
- c. Vibration Mountings & Controls Inc.
- d. Vibroacoustics

B. Base Mounts:

1. Type NP (Neoprene Pad): Pads shall be ribbed or waffle type manufactured from 40 to 50 durometer neoprene and shall be sized to be loaded within the manufacturer's recommendations range. Pad thickness shall be 6mm minimum unless shown otherwise in Part 3 of this specification or on the drawings. Provide steel load distribution plates. Size of pad to be specified by isolator supplier based on load per point. Provide grommet bolt when anchoring. Isolators shall be Mason "Super W" or "WM" or equal.
2. Type NM (Neoprene Mounts): Molded one-piece assemblies with skid resistant base plates and mounting holes. Isolator shall be double deflection type with static deflection range from 8 to 12mm. Neoprene shall be 40 to 50 durometer. The pads shall be sized so that they will be loaded within the manufacturer's recommended range. All metal surfaces shall be neoprene covered to avoid corrosion. Isolators shall be Mason "ND" or equal.
3. Type FS (Freestanding Spring): Free standing and laterally stable spring isolators (single or multiple steel springs) without any housing and complete with 6mm neoprene acoustical pads between the baseplate and the support. Spring diameter shall be no less than 0.8 of the compressed height of the spring at design load. Springs shall be so designed that the ratio of horizontal stiffness to vertical stiffness is not less than 1 and not greater than 2. Provide all mountings with leveling bolts, rigidly bolted to the equipment. Provide height saving mounting brackets where applicable and height adjustment bolts. Isolators shall be Mason type "SLF" or equal.

C. Hangers:

1. Type NH (Neoprene Hangers): Double deflection neoprene-in-shear, sized for a static deflection under loads of 7mm to 12mm. A neoprene neck bushing shall be provided where the hanger rod passes through the hanger housing to prevent the rod from contacting the hanger housing. The diameter of the hole in the housing shall be sufficient to permit the hanger rod to swing through a 30-degree arc before contacting the hanger housing. Isolators shall be Mason "HD" or equal.
2. Type SH (Spring Hangers): Vibration isolation hangers shall consist of a free-standing, laterally-stable steel spring and a neoprene element in series, contained within a steel housing. A neoprene neck bushing shall be provided where the hanger rod passes through the hanger housing to prevent the rod from contacting the hanger housing. Spring diameters and hanger housing lower hole sizes shall be large enough to permit the hanger rod to swing through a 30-degree arc before contacting the housing. Spring elements shall have a minimum additional travel to solid equal to 50 percent of the actual deflection. The neoprene element shall be designed to have a 7mm minimum static deflection. Isolators shall be Mason "30N" or equal..

D. Bases:

1. Type MN (Manufacturer Base): Base as required by manufacturer.
2. Type SB (Integral Structural Steel Bases): Steel bases for floor-mounted equipment which consists of structural steel sections sized, spaced, and connected to form a rigid base that will not twist, rack, deform, or deflect in any manner that will generate stress in the equipment, or degrade the performance of isolation mount. Bases shall be

adequately sized to support basic equipment units and motor plus any associated pipe elbow supports, duct elbow supports, electrical control elements, or other components closely related and requiring resilient support in order to prevent vibration transfer to the building structure. Bases may be rectangular or tee-shaped in plan. The depth of steel frame base members shall be at least one-tenth the longest dimension of the base but not more than 300mm. Bases shall include side-mounting height-saving brackets for attachment to vibration isolators to provide a minimum base clearance of 25mm.

Vibration isolators shall be provided as called for in the mechanical drawings. Bases shall be Mason "WF" or equal provided by the manufacturers listed in Section 2.1.A.

3. Type SRB (Steel Rail Bases): Steel rail for equipment having legs or bases that do not require a complete supplementary base. Members shall be rigid to pre-vent twist, rack, deform or deflect in any manner that will generate stress in the equipment, or degrade the performance of isolation mount. Bases shall be cross-braced to avoid twisting under seismic loads. Vibration isolators shall be provided as called for in the mechanical drawings. Bases shall be Mason "ICS" or equal.

E. Pipe Clevis Sleeves:

1. Type RS (Pipe Sleeve): Resilient pipe sleeve between pipe and clevis, trapeze or clamp. Sleeve shall be constructed of 12mm thick (minimum), 80 kg/m³ closed-cell foam neoprene with maximum durometer 40. Alternatively, a vibration isolation sleeve equivalent to Stoneman Engineering "Trisolator" may be used.

F. Pipe Penetration Sleeves:

1. Type RPS (Resilient Penetration Sleeve/Seal): Resilient penetration sleeve/seal shall be field-fabricated from a pipe or sheet metal section that is 25mm larger in each dimension than the penetrating element and is used to provide a sleeve through the construction penetrated. The sleeve shall extend 25mm beyond the penetrated construction on each side. The annular space between the sleeve and the penetrating element shall be packed tightly with glass fiber or mineral wool to within 6mm of the ends of the sleeve. The remaining 6mm space on each side shall be filled with acoustical sealant to form an airtight seal. The penetrating element shall be able to pass through the sleeve without contacting the sleeve. Alternatively, prefabricated sleeves accomplishing the same result are acceptable, such as Mason "Split Wall Seal, Type SWS".

G. Flexible Duct Connections:

1. Ductwork flexible connections shall be fabricated from flexible airtight-coated fa-bric. Connections shall be constructed from a UL listed fire retardant (25-flame spread, 50 smoke developed rating) neoprene coated woven glass fiber fabric to NFPA 90A and shall withstand the temperatures and pressure involved (Ventfabrics, Durodyne or approved equal). Connectors shall include a companion flange.
2. Connectors shall include companion flange. Strip connections are not accepta-ble. The connectors, between fan intake/discharge and ductwork, overall width shall not be less than 75mm long nor more than 150mm long. Where ducts cross building expansion joints, the connectors overall width shall not be less than 150mm long nor more than 250mm long. Allow at least 25mm slack in these connections to insure that no vibration is transmitted from fan to ductwork. Flex connector shall not be drawn into the duct/air stream.
3. Where duct transition occurs from larger to smaller duct size at connection to the equipment, the flexible connector shall be sized and installed in the larger duct.
4. The fabric shall either be folded in with the metal or attached with metal collar frames at each end to prevent air leakage.

H. Resilient Vertical Pipe Support:

1. Type RP (Riser Clamp Pad): Resilient pad between riser clamp and support structure to eliminate rigid contact. Regufoam, Armaflex or approved equivalent.

I. Acoustical Sealant: Shall be non-hardening, fire-rated sealant as such as Tremco, "TREMstop Acrylic" or approved equal.

J. Neoprene Grommet:

Bridge bearing neoprene sized for bolted connections at resiliently mounted equipment. Nominal Shore Durometer: 60. Mason HG or equivalent.

2.2 SEISMIC-RESTRAINT DEVICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Amber/Booth Company, Inc.
2. Cooper B-Line, Inc.; a division of Cooper Industries.
3. Hilti, Inc.
4. Kinetics Noise Control.
5. Loos & Co.; Cableware Division.
6. Mason Industries.
7. TOLCO Incorporated; a brand of NIBCO INC.
8. Unistrut; Tyco International, Ltd.

B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

C. Snubbers: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.

1. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.
2. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
3. Maximum 1/4-inch air gap, and minimum 1/4-inch-thick resilient cushion.

D. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

E. Restraint Cables: ASTM A 603 galvanized-steel cables with end connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.

F. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.

- G. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.
- H. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.
- I. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.
- J. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.
- K. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.3 FACTORY FINISHES

- A. Finish: Manufacturer's standard prime-coat finish ready for field painting.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation and seismic control devices for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

- A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.
- B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. General Requirements

1. Vibration isolation manufacturer's representative shall supervise and inspect all installed isolation hardware and generate a written punchlist for the Construction Manager, along with corrective measures required. Submit inspection report.
2. The installation or use of vibration isolators must not cause any change in position of equipment, piping, or ducts that result in stresses in any connections or misalignment of shafts or bearings. Equipment shall be maintained in a rigid position during installation. The load shall not be transferred to the isolators until the installation is complete and in operational condition.
3. Prior to installation, the Contractor shall bring to the Commissioner's attention any conflicts between trades that will result in unavoidable rigid contact of equipment, piping, or ducts with the building. Corrective work after installation, necessitated by unresolved conflicts before installation, shall be at the Contractor's expense.
4. The Contractor shall obtain written instructions from the vibration isolation manufacturer as to the proper selection, installation, and adjustment of all vibration isolation devices.
5. No equipment unit shall bear directly on vibration isolators unless its own frame is suitably rigid to span between isolators and such direct support is approved by the equipment manufacturer. This provision shall apply whether or not a base frame is called for on the schedule. In the case that a base frame is required for the unit because of the equipment manufacturer's requirements and is not specifically called for on the equipment schedule, a base frame recommended by the equipment manufacturer shall be provided at no additional expense.
6. Unless otherwise indicated, there is to be a minimum operating clearance of 1" between steel frame bases and the floor beneath the equipment. Position isolator mounting brackets and adjust isolators so that the required clearance is maintained. The clearance space shall be cleaned thoroughly by the Contractor to ensure that no construction debris has been left to short-circuit or restrict the proper operation of the vibration isolation system.
7. Provide a minimum of 1" clearance between the building structure (walls, floors, and ceilings) and vibration isolated supports, pipes, and equipment.
8. Hanger housings should be free to rotate a full 360 degrees about the rod axis without contacting any object.
9. Any bracing or supports for mechanical ductwork, piping, and equipment shall not bridge or reduce the effectiveness of vibration isolators.

B. Vibration Isolated-Equipment

1. The following air handling units shall have internal fans mounted on SB base supported by 2 inch static deflection FS springs:
 - a. Theatre One FCU M-4
 - b. Theatre Two FCU 2-3
 - c. Mezzanine Lobby FCU M-1
2. All vertical fan coil and/or blower coil units shall be supported with NP neoprene mounts:
 - a. Theatre One Control Room FCU M-5
 - b. Theatre Two Control Room FCU 2-2
 - c. Theatre Two Lobby FCU 2-1
3. All hung fan coil and/or blower coil units shall be supported with NH neoprene hangers:
 - a. Ground Floor Lobby FCU G-1
 - b. Prop Shop FCU M-2
 - c. Office FCU M-3
 - d. Theatre Two Dressing Room FCU 2-4

4. Exhaust fans shall be supported with 2 inch static deflection SH spring hangers.
5. Locations of all vibration isolation equipment shall be selected for ease of inspection and adjustment as well as for proper operation.
6. Installation of vibration isolation equipment shall be in accordance with the manufacturer's written instructions.
7. Unless otherwise noted, mount motors on rigid base common with equipment or supported from equipment frame.
8. Fasten all vibration isolators using bolts where holes are provided in the mounting flanges; otherwise, adhere using structural adhesive. Where mounting flanges are steel, use neoprene grommets (Mason Industries HG or equivalent) and washers under anchor bolts. Where vibrating elements are to be fastened to structural elements provide connection details for review.
9. All vibration-isolated equipment shall be connected to the adjacent ductwork or pipework system via a flexible connection positioned to avoid a direct connection between equipment and mounting surface.
10. Do not use vibration isolation components to straighten or connect misaligned sections of piping or ductwork.
11. Inspect all vibration-isolated equipment, coordinate the work of all involved trades, and verify that vibration isolators are not short-circuited by drain lines, conduits, control tubing, duct connections, pipe connections, etc.
12. Adjust all leveling bolts and hanger rod bolts so that the isolated equipment is level and in proper alignment with connecting ducts or pipes.
13. Hanger rods shall be aligned and free of contact with hanger box.
14. Align spring isolation hanger rods to clear the hanger box under all operating conditions.
15. Level vibration isolated equipment under rated design operating conditions while maintaining the isolation criteria. Isolators shall be plumb and aligned to preclude misalignment or undesired contact during operation.
16. Separate snubbers shall be provided for all floor-mounted equipment on open-type (un-restrained) spring mounts. Provide a minimum of four snubbers at each item of equipment. Snubbers shall not be in contact during normal equipment operation. Number, size, and method of installation shall be as recommended by the isolator supplier.

C. Flexible Duct Connections

1. Flexible duct connections shall be installed at all fan unit intakes, fan unit discharges, and wherever else shown on the drawings or elsewhere specified. If used at axial flow fan discharge or intake, flexible connector shall be placed after transition ducts.
2. The connectors, between fan intake/discharge and ductwork, overall width shall not be less than 3 inches long nor more than 6 inches long. Where duct crossing building expansion joints, the connectors overall width shall not be less than 6 inches long nor more than 10 inches long. Allow at least 1 inch slack in these connections to insure that no vibration is transmitted from fan to ductwork.
3. Install flexible connections in ducts that cross structural expansion joints.
4. Where duct transition occurs from larger to smaller duct size at connection to the equipment, the flexible connector shall be sized and installed in the larger duct.
5. The fabric shall either be folded in with the metal or attached with metal collar frames at each end to prevent air leakage.
6. Sheet metal ducts or plenum openings shall be squarely aligned with the fan discharge, fan intake, or adjacent duct section prior to installation of the flexible connection so that the clear separation is not greater than 3" and equal all the way around the perimeter. Flexible duct connections shall not be installed until this provision is met. Allow at least 1 inch slack in connections.
7. Secure fabric connectors tightly to fans, casings and ducts as follows:

- a. Secure round connectors with No. 12 US gage by 1 inch wide galvanized steel draw bands. Secure bands with bolts and nuts or use companion flanges.
- b. Secure rectangular connectors with 1 inch by 1/8-inch thick flat galvanized steel bars, with screws or bolts on 8 inch centers maximum, or with sheet metal slip joints. Tightly crimp fabric into sheet metal joint and secure complete joint with sheet metal screws on 6-inch centers maximum.

D. Thrust Restraints

1. Provide thrust restraints as necessary for air handling equipment and fans with total static pressure greater than or equal to 2 inches w.g. to prevent excessive displacement due to air thrust.
2. Thrust restraints shall be attached at the centerline of thrust and symmetrically on each side of the unit. Adjust the restraints to limit equipment movement to the specified limit.
3. Restraints must be installed carefully and adjusted carefully after setup system startup to insure that clearances are maintained for both isolators and snubbers.

E. Piping and Ductwork

1. All chilled water piping shall be isolated from the building structure within the mechanical rooms using type NH hangers.
2. Passive piping (city water, sprinkler water, gases, waste water, etc.) can be rigidly supported throughout unless this piping is racked with active piping requiring isolation as in Item 1 above.
3. Piping connected to vibration-isolated equipment shall be installed so that it does not strain or force out of alignment pipe flexes or vibration isolators supporting either the equipment or the piping.
4. Do not suspend plumbing or piping from ducts, conduits or related supports.
5. Unless otherwise noted, no electrical conduit, fixture, ceiling suspension wires or other elements of the building construction attached to or abutted against the duct and piping systems.
6. Fire Protection Piping: Support and brace in accordance with NFPA Pamphlet 13. Piping 2-1/2 inches and larger and 12 inches or more below the attachment to the building structure shall be supported in accordance with NFPA 13 but shall be seismically braced.

F. Services Penetrations

1. All Piping and Ductwork:
 - a. Where each duct penetrates partitions and slabs, create an acoustic seal around the ducts described herein and shown on the mechanical drawings.
 - b. If the gap between the duct and the structure exceeds 1 inch, pack the gap with fiberglass and cover the entire joint with an 18 gauge metal angle bracket or 5/8 inch gypsum board cover plate. Fully bed the angle or cover plate in non-hardening acoustical sealant.
 - c. If the gap between the duct and the structure is less than 1/2 inch, pack the gap with fiberglass and sealed with non-hardening acoustical sealant backed by foam rod.

G. Miscellaneous Mechanical Equipment: Mechanical equipment with unscheduled vibration isolation shall be vibration-isolated from the building structure by Unit NP or Unit NH isolators.

H. Isolation of Fractional Horsepower Equipment: Isolate all fractional horsepower fans, pumps, and equipment which are mounted on or suspended from floors that are not on-grade with

- neoprene-in-shear isolators as specified except where such isolators are furnished as an integral part of the machine.
- I. Electrical Connections to Resiliently Mounted Equipment: Make electrical connections to equipment which is supported or suspended by vibration isolators with long lengths of flexible steel conduit or flexible armored cable. Locate these flexible connections so as to prevent rigid connections between the resiliently mounted equipment and the building structure.
- J. Equipment Restraints:
1. Install seismic snubbers on HVAC equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
 2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
 3. Install neoprene grommets between restraining bolt and anchor brackets.
 4. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.
- K. Piping Restraints:
1. Comply with requirements in MSS SP-127.
 2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
 3. Brace a change of direction longer than 12 feet.
- L. Install cables so they do not bend across edges of adjacent equipment or building structure.
- M. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.
- N. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
- O. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- P. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- Q. Drilled-in Anchors:
1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole

and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.

5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Division 23 Section "Hydronic Piping" for piping flexible connections.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections:
 1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
 2. Schedule test with the City of New York, through Architect, before connecting anchorage device to restrained component (unless post-connection testing has been approved), and with at least seven days' advance notice.
 3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
 4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
 5. Test to 90 percent of rated proof load of device.
 6. Measure isolator restraint clearance.
 7. Measure isolator deflection.
 8. Verify snubber minimum clearances.
 9. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.
- C. Remove and replace malfunctioning units and retest as specified above.
- D. Prepare test and inspection reports.

3.6 ADJUSTING

- A. Adjust isolators after piping system is at operating weight.
- B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.
- C. Adjust active height of spring isolators.
- D. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 23 05 48

SECTION 23 05 53 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.
 - 4. Duct labels.
 - 5. Stencils.
 - 6. Valve tags.
 - 7. Warning tags.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Adhesive backed plastic tape:
 - 1. Small labels: adhesive backed plastic tape with embossed letters in contrasting colors. Tape shall be 3/8" wide.

2. Large labels: adhesive backed plastic tape with embossed letters in contrasting colors. Tape shall be 3/4" wide.
3. Make: Seton Name Plate Company.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Red.

D. Maximum Temperature: Able to withstand temperatures up to 200 deg F (93 deg C).

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

C. Pipe Label Contents: Include identification of piping service using same designations as used on Drawings, pipe size, and an arrow indicating flow direction. Colored background shall conform to American National Standards Institute (ANSI) Standard A13.1:

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.

2. Lettering Size: At least 1-1/2 inches high.
3. Make: Seton Name Plate Company, Setmark or approved equal

2.4 DUCT LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
- B. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- C. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- D. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- E. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- F. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.
 1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions or as separate unit on each duct label to indicate flow direction.
 2. Lettering Size: At least 1-1/2 inches high.

2.5 STENCILS

- A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4 inches for ducts; and minimum letter height of 3/4 inch for access panel and door labels, equipment labels, and similar operational instructions.
 1. Stencil Material: Fiberboard.
 2. Stencil Paint: Exterior, gloss, acrylic enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
 3. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1 unless otherwise indicated.

2.6 VALVE TAGS

- A. Valve Tags:
 1. Tags shall be 1-3/4" by 3-1/4" laminated with two (2) 0.020" thick plastic sheets with matte finish and with a brass eyelet in the corner.
 2. Typed information shall include appropriate alphanumeric code (prefixed with "H" for heating, etc.), system designation, the fluid in the pipe, and size and function of the valve.
 3. Fasteners: Brass beaded chain around the valve and through the tag eyelet.
- B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch (A4) bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
 1. Valve-tag schedule shall be included in operation and maintenance data.

2.7 WARNING TAGS

- A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
 - 1. Size: Approximately 4 by 7 inches.
 - 2. Fasteners: Reinforced grommet and wire or string.
 - 3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
 - 4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each scheduled item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Piping Color-Coding: Painting of piping is specified in Division 09 Section "Painting".
- B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 30 feet along each run. Reduce intervals to 15 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
 - 8. Pipe label lettering must be installed right side up for easy reading.

C. Pipe Label Color Schedule:

1. Green background with white lettering
 - a. Chilled Water Supply, Chilled Water Return
 - b. Condensate
 - c. Vent
2. Yellow background with black lettering
 - a. Hot Water Supply, Hot Water Return

3.4 DUCT LABEL INSTALLATION

A. Install self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:

1. White lettering with green background:
 - a. Supply Air
2. White lettering with blue background:
 - a. Outside Air Intake
3. Black lettering with yellow background:
 - a. Return Air
 - b. Exhaust Air
 - c. Relief Air
4. ASME A13.1 Colors and Designs: For hazardous material exhaust.

B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 30 feet in each space where ducts are exposed or concealed by removable ceiling system.

C. Pipe label lettering must be installed right side up for easy reading.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:
 - a. Chilled Water: 1-1/2 inches square.
 - b. Hot Water: 1-1/2 inches square.
2. Valve-Tag Color: Letter and background color to match associated pipe marker color scheme.

3.6 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 23 05 53

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Provide commissioning as per third party commissioning agent requirements. Refer to commissioning specification for requirements.

1.2 SUMMARY

- A. Provide all labor, materials, tools and equipment, man-lifts, incidentals and services to carry out the work of this section. This Section includes TAB to produce design objectives for the following:
 - 1. Air Systems:
 - a. Constant-volume air systems.
 - b. Variable-air-volume systems.
 - c. All Miscellaneous air moving devices.
 - 2. Hydronic Piping Systems:
 - a. Variable-flow systems.
 - 3. HVAC equipment.
 - 4. Space pressurization testing and adjusting.
 - 5. Vibration measuring.
 - 6. Sound level measuring.
 - 7. Smoke-exhaust systems testing and adjusting.
 - 8. Indoor-air quality measuring.
 - 9. Verifying that automatic control devices are functioning properly.
 - 10. Reporting results of activities and procedures specified in this Section.

1.3 DEFINITIONS

- A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.
- B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to indicated quantities.
- C. Barrier or Boundary: Construction, either vertical or horizontal, such as walls, floors, and ceilings that are designed and constructed to restrict the movement of airflow, smoke, odors, and other pollutants.
- D. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.
- E. NC: Noise criteria.

- F. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.
- G. RC: Room criteria.
- H. Report Forms: Test data sheets for recording test data in logical order.
- I. Smoke-Extract System: A system that uses fans to exhaust smoke from the building with make-up air by infiltration through dedicated openings or fan powered.
- J. Smoke-Extract Zone: A space within the building that is part of a zoned smoke-purge system.
- K. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.
- L. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.
- M. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
- N. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.
- O. TAB: Testing, adjusting, and balancing.
- P. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.
- Q. Test: A procedure to determine correct operation and quantitative performance of systems or equipment.
- R. Testing, Adjusting, and Balancing (TAB) Firm: The entity responsible for performing and reporting TAB procedures.

1.4 SUBMITTALS

- A. LEED Submittal:
 - 1. Air-Balance Report for LEED Prerequisite EQ 1: Documentation of work performed for ASHRAE 62.1-2004, Section 7.2.2, "Air Balancing."
- B. Qualification Data: Within 30 days from Contractor's Notice to Proceed, submit 6 copies of evidence that TAB firm and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- C. Contract Documents Examination Report: Within 60 days from Contractor's Notice to Proceed, submit 6 copies of the Contract Documents review report as specified in Part 3.
- D. Strategies and Procedures Plan: Within 90 days from Contractor's Notice to Proceed, submit 6 copies of TAB strategies and step-by-step procedures as specified in Part 3 "Preparation". Include a complete (all design data filled in) set of report forms intended for use on this Project. Submit plan drawings of the systems keying individual devices to be balanced to the forms.

- E. Certified TAB Reports: Submit two copies of final reports prepared, as specified in this Section, on approved forms certified by TAB firm. Submit plan drawings of the systems keying individual devices balanced to the forms.
- F. Instruments: A complete list of instruments proposed to be used, organized in appropriate categories, with data sheets for each. Show:
 - 1. Manufacturer, model and serial number.
 - 2. Description and use when needed to further identify the instrument.
 - 3. Size or capacity range.
 - 4. Latest calibration date and certificates of calibration.
- G. Reports on "Examinations" specified in Part 3 of this Section.
- H. Warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Qualifications: Engage a TAB firm certified by either AABC or NEBB. TAB Technicians shall have a minimum of 2 years experience and shall be certified by either the AABC or NEBB. All work shall be carried out under the supervision of the approved TAB technicians. The TAB firm shall submit certification of their current membership of either NEBB or AABC.
- B. TAB Conference: Meet with Commissioner's representatives on approval of TAB strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of TAB team members, equipment manufacturers' authorized service representatives, HVAC controls installers, and other support personnel. Provide seven days advance notice of scheduled meeting time and location.
 - 1. Agenda Items: Include at least the following.
 - a. Submittal distribution requirements.
 - b. The Contract Documents examination report.
 - c. TAB plan.
 - d. Work schedule and Project-site access requirements.
 - e. Coordination and cooperation of trades and subcontractors.
 - f. Coordination of documentation and communication flow.
- C. TAB Report Forms: Use standard forms from NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems", or similar by AABC.
- D. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following.
 - 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
 - 2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.
 - 3. The TAB Contractor shall provide a NEBB or AABC Certificate of Conformance Certification (issued by the NEBB or AABC national office) for all work specified to confirm that the work has been carried out in accordance with the applicable NEBB or AABC Standards and Procedures, and the provisions of the NEBB or AABC Quality Assurance Conformance Certification Rules of Procedures.

- E. Instrumentation Type, Quantity, and Accuracy: As described in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification", or similar by AABC.
1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.
- F. Reference Standards:
1. General mechanical systems: Comply with applicable procedures and standards of "National Standards for Field Measurements and Instrumentation, Total System Balance" by the Associated Air Balance Council (AABC).
 2. NEBB – National Environmental Balancing Bureau
 3. SMACNA – Sheet Metal and Air Conditioning Contractors National Association
 4. ASHRAE – Handbook of Fundamentals

1.6 PROJECT CONDITIONS

- A. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.
- B. System Readiness
1. The building envelope must be complete. All windows, doors, insulation, internal sheet finishes (such as gypsum wall board), cladding curtain walling, etc., must be installed so that the full specified performance of the envelope is achieved.
 2. The specified system being tested and balanced must be complete. Balancing of partially completed systems will not be acceptable. Sub-systems may be tested and balanced separately. A mechanical sub-system is an air handling unit or fan together with its associated ductwork, terminal units, dampers, grilles and diffusers. Fans that operate together, such as AHU supply and return fans, or ventilation supply and exhaust fans serving common area shall be tested together as a common mechanical sub system.
 3. The system must be running fault free.
 4. Pressure testing and leak testing must be satisfactorily complete.

1.7 COORDINATION

- A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.
- B. Coordinate with the Construction Manager to produce a complete schedule for the TAB work including identifying all other aspects of the construction work by other trades upon which successful completion of the TAB work depends. All such dependencies shall be identified to allow proper sequencing of the required work. This schedule shall be prepared using the same computer software as the construction manager's schedule such that it can be added to the construction manager's schedule. Schedule shall be kept up-to-date. The schedule shall show, as a minimum:
1. Itemize all systems to be made operational, tested and balanced.
 2. Identify the dates that system construction, cleaning, pressure testing and pre-testing will be completed.)

3. Identify interdependencies between systems that impact the TAB work. (For example, the heating system cannot be considered complete until the associated electrical power system and controls system are complete.
 4. Each trade affected by and required for the TAB will be identified to ensure that the adequate time for their work is scheduled.
 5. Identify the beginning and end of the TAB work for each building system.
 6. All submittal dates for first, second, etc., submittals shall be clearly identified on the schedule. Required review and re-submittal dates shall also be included.
 7. Requirements for tests and inspections required by AHJ and schedule for inspections completion, submission, and approval.
 8. Include dates for training of Owner's staff.
- C. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.
- D. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.
- E. Coordinate with the work of Section 230900 and 230993 to determine positions of all dampers and control valves in accordance with the outlined sequences of operation.
- F. In the event the TAB Contractor fails to coordinate with any party and costs are incurred for testing or retesting by any party as a result of this failure to coordinate, then the TAB Contractor shall be responsible for these costs.
- G. TAB Meetings
1. The TAB Contractor's Project Manager shall attend regular commissioning meetings as required by the Construction Manager.

1.8 WARRANTY

- A. Guarantee From Contractor
1. Contractor's Guarantee Obligation: The Contractor shall promptly repair, replace, restore or rebuild, as the Commissioner may determine, any finished Work in which defects of materials or workmanship may appear or to which damage may occur because of such defects, during the one (1) year period subsequent to the date of Substantial Completion (or use and occupancy in accordance with the Contract).
 2. Guaranty Period: The obligation of the Contractor, and its Surety under the Performance Bond, is limited to the period(s) of time specified above.
- B. Special Guarantee: Provide a guarantee on NEBB forms stating that NEBB will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee shall include the following provisions:
1. The certified TAB firm has tested and balanced systems according to the Contract Documents.
 2. Systems are balanced to optimum performance capabilities within design limits.
- C. During the warranty period of one year following substantial completion of TAB, seasonal testing and other deferred testing required shall be completed. The TAB firm shall coordinate this activity with the Owner and CM.

1. Approximately six months after completion of the TAB, the TAB firm shall return to the project site for Seasonal Testing and carryout a 72-hour run test of the complete building systems as described above. All sensors, devices, etc., shall be trended for this period and presented in graphical format at a useful resolution. The TAB firm shall make any adjustments necessary to the system to ensure all systems and systems components are operating in a correct manner and that design conditions are being maintained within the building without hunting. See also paragraph 3.4.F. of this Section.
2. In addition the TAB firm will return to the project approximately 10 months into the warranty period. During this visit(s) the TAB firm will review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal commissioning. The TAB firm will also interview facility staff and identify problems or concerns they have operating the building as originally intended. The TAB firm will make suggestions for improvements and will record these changes in the O&M manuals.
3. Deferred Testing: any system or item that cannot be properly tested during the construction period, due to, for example, weather conditions, shall be tested and balanced as far as possible. The TAB process shall be completed when conditions are favorable.

D. Final Acceptance

1. When all TAB work has been carried out, the building systems will be run in full automatic mode for a minimum period of 72 hours. All FMS sensors, devices, etc., shall be trend logged every minute and presented in a graphical format at a useful resolution. Final acceptance of the building systems will be contingent upon the system maintaining conditions within design tolerances without hunting for all of the 72 hours.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents, and any subsequent revisions to these, to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
 1. Contract Documents are defined in the General and Supplementary Conditions of Contract.
 2. Verify that the necessary TAB devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, access doors and panels, manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing and for efficient system and equipment operation.
 3. The lead TAB technician shall visit the job bi-weekly during construction to review the installation. Submit written report with suggestions for work to be performed or devices added to allow for proper balancing. This technician shall verify that Work, fittings, dampers, balancing devices, etc. are properly fabricated and installed as specified or shown and that proper balancing can be done.
- B. Examine approved submittal data of HVAC systems and equipment and use in TAB process.
- C. Examine Project Record Documents described in DDC General Conditions to ensure all TAB devices and final approved values are recorded.

- D. Examine equipment performance data including fan and pump curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.
- E. Examine system and equipment installations to verify that they are complete and that testing, flushing, cleaning, and adjusting specified in individual Sections have been performed.
- F. Examine system and equipment test reports.
- G. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation. Perform this inspection as often as necessary to ensure all work is inspected prior to closing-in or concealment.
- H. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.
- I. Examine HVAC equipment to ensure that clean filters have been installed, coils, fans, dampers, plenums, ducts, etc. are clean, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- J. Examine terminal units, such as variable-air-volume boxes, to verify that they are accessible and their controls are connected and functioning.
- K. Examine plenum ceilings used for supply air to verify that they are airtight. Verify that pipe penetrations and other holes are sealed.
- L. Examine strainers for clean screens and proper perforations.
- M. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.
- N. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- O. Examine system pumps to ensure absence of entrained air in the suction piping.
- P. Examine equipment for installation and for properly operating safety interlocks and controls.
- Q. Examine automatic temperature system components to verify the following:
 - 1. Dampers, valves, and other controlled devices are operated by the intended controller.
 - 2. Dampers and valves are in the position indicated by the controller.
 - 3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes all motorized dampers and valves and variable-air-volume terminals.
 - 4. Automatic modulating and shutoff valves, including two-way valves and three-way mixing and diverting valves, are properly connected.
 - 5. Thermostats and humidistats and sensors are located to avoid adverse effects of sunlight, drafts, and cold walls.

6. Sensors are located to sense only the intended conditions.
7. Sequence of operation for control modes is according to the Contract Documents.
8. Controller set points are set at indicated values.
9. Interlocked systems are operating.
10. Changeover from heating to cooling mode occurs according to indicated values.

- R. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.
- B. Complete system readiness checks and prepare system readiness reports. Verify the following:
1. Permanent electrical power wiring is complete.
 2. Hydronic systems are filled, flushed and cleaned and free of air.
 3. Automatic temperature-control systems are operational.
 4. Equipment and duct access doors are securely closed.
 5. Balance, smoke, and fire dampers are open.
 6. Isolating and balancing valves are open and control valves are operational.
 7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
 8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 PRELIMINARY TESTING

- A. The Mechanical Contractor will carry out a series of preliminary tests prior to the commencement of the TAB work of this contract. The intent of these tests is to demonstrate that the equipment operates properly in all modes. The TAB Contractor shall review these test reports and shall record from these reports any data required to carry out the work of this contract.
- B. The Mechanical Contractor shall, as a minimum, carry out the tests, procedures and checks recommended by the equipment manufacturer and shall use the services of equipment manufacturer representatives to ensure the successful start-up and correct operation of all systems and equipment.
- C. The TAB Contractor shall witness the above work and submit a deficiency report for any incomplete work that will affect the work of this Contract.
- D. The TAB Contractor shall review and report on the following, as a minimum:
1. Installation of equipment
 2. Installation of devices
 3. Completeness of the ductwork and pipework installation
 4. Installation of access doors or other access provisions for balancing devices, fire and smoke dampers

- E. The TAB Contractor shall issue reports weekly during the Mechanical Contractors preliminary testing process. Any major deficiencies shall be reported daily.
- F. The TAB Contractor shall witness the Mechanical Trade Contractors ductwork leakage and pipe pressure tests.

3.4 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems" and this Section.
- B. Cut insulation, ducts, pipes and equipment cabinets for installation for test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes to prevent leakage and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this project.
- C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-controllers, and similar controls and devices, to show final settings.
- D. Take readings as shown, specified and as required to demonstrate that all equipment terminal devices, controls, etc. are operating in accordance with scheduled or manufacturer's published ratings.
- E. Make adjustments and/or corrections to equipment, air systems necessary for proper balancing.
- F. Perform capacity checks of heating systems during the balancing period and again during design condition the following winter. Perform capacity checks for cooling systems during the balancing period and again during design the following summer.
- G. Operating tests of heating and cooling apparatus, fans, and other equipment to be of not less than four hours duration, after stabilized operating conditions have been established. Capacities to be based on temperatures, air and water quantities measured during such tests.
- H. Take and report testing and balancing measurements in inch-pound (IP) units.
- I. The TAB Contractor shall confirm in the reports that deficiencies identified in Mechanical Services installation have been corrected prior to the commencement of the TAB work.
- J. The specified systems shall be reviewed and inspected for conformance to the design documents. Testing, adjusting and balancing on each system shall be performed. The accuracy of measurements shall be in accordance with AABC or NEBB Standards. See below for tolerances on measured quantities.
- K. Any deficiencies in the installation or performance of a system or component shall be reported in writing to both the Mechanical Trade Contractor and Consultant.
- L. Should the results of balancing indicate that a mechanical system does not provide the design intent performance, then the Consultant, the Mechanical Contractor and the TAB Contractor shall review the results. The Consultant shall approve any corrections that are to be made by the Mechanical Contractor.

- M. Should the results of balancing indicate that particular equipment does not provide the design intent performance then the Mechanical Contractor shall repair or replace the equipment. The TAB Contractor shall retest the equipment.

3.5 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans, ducts and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems "as-built" duct layouts for use in recording measurements. Diagram shall show all equipment components and be cross-referenced to the TAB forms and reports.
- C. For variable air-volume systems, develop a plan to simulate diversity, where system capacity (fans) is less than the sum of the outlet volumes.
- D. Determine the best locations in main and branch ducts for accurate duct airflow measurements.
- E. Check airflow patterns from the outside-air louvers and dampers and the return-and exhaust-air dampers, through the supply-fan discharge and mixing dampers.
- F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- G. Verify that motor starters are equipped with properly sized thermal protection.
- H. Check dampers for proper position to achieve desired airflow path and proper operation. For automatic dampers, fan speeds, etc., work with controls contractor to establish and set required positions and values to maintain design airflow for different operating conditions specified.
- I. Check airflow blockages and resolve.
- J. Check condensate drains for proper connections and proper function.
- K. Check for proper sealing of air-handling unit components
- L. Adjust air quantities to following tolerance:
 - 1. Each outlet of 200 cfm or less: Minus 0 to plus 10 percent of design.
 - 2. All other outlets: Minus 0 to plus 5 percent.
 - 3. Each room with multiple outlets: Minus 0 to plus 5 percent.
 - 4. Each floor or major zone: Minus 0 to plus 5 percent.
 - 5. Fans: Minus 0 to plus 5 percent.
 - 6. Temperature readings: Within ½ degree F.
 - 7. Equipment Pressure drops readings: 0.10 inch W.G.
 - 8. Space pressure readings: 0.05 inch W.G.
- M. Final Measurements of Air Quantity: Make final measurement of air quantity, after the air terminal has been adjusted to provide the optimum air patterns of diffusion. Adjust all diffusers and registers to eliminate drafts in all areas and result in uniform distribution.
- N. Verify that ductwork, dampers, grilles, registers and diffusers have been installed per design.

- O. Balance air handling systems at minimum outdoor air quantities. On completion of balancing procedures, retest at maximum outdoor air quantities.
- P. Test and record motor voltage and amperage. Compare data with nameplate limits.
- Q. Perform pitot tube traverse at all main and branch ducts. Compare traverse total with measured outlet total to determine actual duct leakage.
- R. Test and adjust minimum outdoor and relief air volumes.
- S. Test and record system static pressure profile for each air handling system at minimum outdoor air volume. Note coil (i.e. wet/dry) and filter condition of time of testing.
- T. Test and record entering and leaving air conditions for each heat transfer coil and device. Simulate conditions to achieve winter or summer design patterns.
- U. Test and record settings of motor thermal overload devices. Adjust settings where required.
- V. Verify air flow measurement at all airflow monitoring stations. Coordinate positioning of dampers with the FMS Trade Contractor and the air monitoring station manufacturer.
- W. Verify minimum outside air flow requirements. Coordinate damper position with the FMS Trade Contractor.
- X. Adjust duct distribution to obtain specified air quantities. At least one zone balancing damper shall be completely open. Multi diffuser/grille branch ducts shall have at least one volume damper completely open.

3.6 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure fan static pressures to determine actual static pressure as follows:
 - a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
 - b. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
 - c. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
 - 2. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
 - a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters
 - 3. Measure static pressures entering and leaving other devices, such as sound traps, under final balanced conditions to create a complete static pressure profile for the system.
 - 4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.

5. Obtain approval from Engineer for adjustment of fan speed higher or lower than indicated speed. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes. Provide sheaves and belts for a minimum of one change per fan.
 6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and branch ducts to indicated airflows within specified tolerances.
1. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
 2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust and measure to indicated airflows within specified tolerances.
- C. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
- D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch duct volume dampers rather than dampers at air terminals where relevant.
1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
 2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.7 PROCEDURES FOR TYPICAL VARIABLE-AIR-VOLUME SYSTEMS

- A. Compensating for Diversity: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a maximum set-point airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced airflow terminal units so they are distributed evenly among the branch ducts.
- B. Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:
1. Set outside-air dampers at minimum, and return- and exhaust-air dampers at a position that simulates full-cooling load.
 2. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use terminal-unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units as described for constant-volume air systems.
 3. Select the terminal that is most critical for the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
 4. Measure total system airflow. Adjust to within indicated design airflow tolerances.

5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow as described for constant-volume air systems.
 - a. If air outlets are out of balance at minimum airflow, report the condition but leave outlets balanced for maximum airflow.
6. Test and record the amplified velocity pressure signal and inlet static pressure for maximum and minimum for each terminal unit.
7. Re-measure the return airflow to the fan while operating at maximum return airflow. Balance the return-air ducts and inlets as described for constant-volume air systems. Where the return fan is controlled by static pressure sensor measure static pressure at the most critical terminal unit and adjust the static-pressure controller to ensure that adequate static pressure is maintained at the most critical unit.
8. Record the final fan performance data.
9. Test and measure supply and return fan tracking by total air flow measurements at 33%, 66% and 100% of maximum supply flow.
10. Refer to paragraph "Procedures For Outside Air Volume And Space Pressurization Measurements and Adjustments for further information and to determine corresponding return fan performance.
11. Obtain approval from Engineer for adjustment of fan speed higher or lower than indicated speed. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes. Provide sheaves and belts for a minimum of one change per fan.
12. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.

3.8 PROCEDURES FOR MISCELLANEOUS AIR SYSTEMS

A. Unit Heaters

1. Ensure unit and associated controls are functioning properly.
2. Verify fan volumes match manufacturer's performance values.
3. Verify hydronic parameters in accordance with paragraph 3.13.

B. Cabinet Heaters

1. Ensure unit and associated controls are functioning properly.
2. Verify fan volumes match manufacturer's performance values.
3. Verify hydronic parameters in accordance with paragraph 3.13.

C. Fan Coil Units

1. Ensure unit and associated controls are functioning properly.
2. Verify fan volumes match manufacturer's performance values.
3. Verify hydronic parameters in accordance with paragraph 3.13.

D. Exhaust Systems

1. Test and balance all building exhaust systems using the requirements given above for the constant or variable air volume systems as relevant.
2. Record static pressure profile, and current draw and rpm for each fan system.

3.9 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

- A. Prepare test reports with pertinent design data and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against approved pump flow rate. Correct variations that exceed plus or minus 5 percent. Temperature to be within 2°F of design value.
- B. Prepare schematic diagrams of systems' "as-built" piping layouts for use in recording measurements. Diagrams shall show all components and be cross-referenced to the tab forms and reports.
- C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:
 - 1. Open all manual valves for maximum flow.
 - 2. Check expansion tank liquid level.
 - 3. Check for adequate pressure at system high point (minimum 5 psig).
 - 4. Check flow-control valves for specified sequence of operation.
 - 5. Check flow rates through each pressure independent flow control valve and confirm it is in accordance with manufacturer's selection data.
 - 6. Set differential-pressure control valves at the specified differential pressure (chilled water).
 - 7. Set system controls so automatic valves are wide open to heat exchangers.
 - 8. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
 - 9. Check air vents for a forceful liquid flow exiting from vents when manually operated.
- D. Check and adjust if necessary the settings on all pressure and safety relief valves.
- E. Adjust cut-in and cut-out settings on glycol feed pumps.
- F. The specified systems shall be reviewed and inspected for conformance to the design documents. Testing, adjusting and balancing on each identified system shall be performed. The accuracy of measurements shall be in accordance with AABC or NEBB Standards. See below for tolerances on measured valves.
- G. For hydronic systems utilizing glycol, obtain updated pump curves from the manufacturer based on actual percentage of system of system glycol. Submit these pump curves with the balancing reports.
- H. Should the results of balancing indicate that a mechanical does not provide the design intent performance, then the Consultant, the Mechanical Contractor and the TAB Contractor shall review the results. The Consultant shall approve any corrections that are to be made by the Mechanical Contractor.
- I. Should the results of balancing indicate the particular equipment does not provide the design intent performance then the Mechanical Contractor will repair or replace the equipment. The TAB Contractor shall retest the equipment.
- J. Equipment settings, manual valve indicators, pumps speeds, and similar controls and devices shall be physically marked to show final settings and identified in the final report.
- K. Test and adjust system feeders to ensure adequate system static pressure is available under all operating conditions.

- L. The TAB Contractor shall allow for removal and replacement of radiation covers as required to access radiation control valves.

3.10 PROCEDURES FOR HYDRONIC SYSTEMS

- A. Measure water flow at pumps. Use the following procedures;
 1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size. Trim or change pump impellers to deliver the flow at the lowest actual total system head pressure. Pumps shall be free of cavitation and vibration.
 2. Check system resistance and flow rate. With all valves open, read pressure differential across the pump operating at full speed and mark pump manufacturer's head-capacity curve. Compare to design value and determine reasons for any difference found.
 3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
- B. Test and adjust (where adjusting devices are provided) water flow to all hydronic equipment to obtain the specified flow. Confirm flow rate and pressure drop at each pressure independent control valve. Compare actual equipment water side pressure drops with manufacturer's published data. Flows shall be measured using ultrasonically. System components that have cv ratings or an accurately catalogued flow-pressure drop relationship may be used as a flow indicating device.
- C. Where equipment is used for heat transfer to air measure entering and leaving liquid and air conditions and compare to manufacturer's published data.
- D. Verify control of differential pressure using pumps and pump by-pass valve (chilled water).
- E. Adjust pump differential pressure controllers set points to achieve required flow in all branches of the circuits.

3.11 PROCEDURES FOR MOTORS

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
 1. Manufacturer, model, and serial numbers.
 2. Motor horsepower rating.
 3. Motor rpm.
 4. Efficiency rating.
 5. Nameplate and measured voltage, each phase.
 6. Nameplate and measured amperage, each phase.
 7. Starter thermal-protection-element rating.
- B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

3.12 PROCEDURES FOR HEAT-TRANSFER COILS AND OTHER TERMINAL DEVICES

- A. Water Coils: Measure the following data for each coil and adjust to achieve design values;
1. Entering- and leaving-water temperature.
 2. Water flow rate.
 3. Water pressure drop.
 4. Dry-bulb temperature of entering and leaving air.
 5. Wet-bulb temperature of entering and leaving air for cooling coils.
 6. Airflow.
 7. Air pressure drop.

3.13 PROCEDURE FOR FINNED TUBE

- A. Ensure finned tube controls are functioning correctly.
- B. Verify hydronic parameters in accordance with paragraph 3.14 as applicable.

3.14 PROCEDURES FOR TEMPERATURE MEASUREMENTS

- A. During TAB, report the need for adjustment in temperature regulation within the automatic temperature-control system.

3.15 PROCEDURES FOR OUTSIDE AIR VOLUME AND SPACE PRESSURIZATION MEASUREMENT AND ADJUSTMENTS

- A. General
1. Outside air is introduced to the building via the air handling units for 3 functions:
 - a. Space pressurization
 - b. Exhaust system make-up air
 - c. Ventilation air for occupants
 2. Air is removed from the building by:
 - a. Exfiltration due to over pressurization
 - b. Return fans in air handling systems which spill some of this return air.
 - c. Miscellaneous building exhaust systems including, but not limited to, bathroom exhaust, retail exhaust, combustion air, air craft loading walkway pressurization, etc.
 3. The building shall be positively pressurized at all times. Refer to building air balance information on the drawings.
- B. Test and adjust so that space pressurization is achieved in the following operating modes:
1. Unoccupied with all exhaust systems off.
 2. Unoccupied with all fixed rate, 24/7 exhaust systems operating.
 3. Unoccupied with variable run-time exhaust systems operating, in addition to the systems in paragraph (2) above. Begin with none of these variable run-time systems operating, start one at a time and ensure positive pressurization is obtained and stability maintained before starting the next. Repeat test for shutdown of these systems, one at a time.
 4. Simulate building occupancy by adjusting the CO₂ measured values to test that the ventilation air quantity control is correctly operational. Ensure system air balance

- maintains positive building pressurization under varying values of return air CO2 levels. Test for 3 different CO2 values.
5. Where space pressure sensors and controls are provided ensure specified differential is achieved.
 6. Refer to Sequences of Operation in Section 230993 and confirm system operation complies.
- C. Before testing for space pressurization, observe the space to verify the integrity of the space boundaries. Verify that windows and doors are closed and applicable safing, gaskets, and sealants are installed. Report deficiencies and postpone testing until after the reported deficiencies are corrected.
- D. Measure, adjust, and record the pressurization of each room and each zone by adjusting the supply, return, and exhaust airflows to achieve the indicated conditions: air flow is used as the design criteria for space pressurization, except where pressure differential control is specified.
- E. Record indicated conditions and corresponding initial and final measurements. Report deficiencies.

3.16 PROCEDURES FOR VIBRATION MEASUREMENTS

- A. Use a vibration meter meeting the following criteria:
1. Solid-state circuitry with a piezoelectric accelerometer.
 2. Velocity range of 0.1 to 10 inches per second.
 3. Displacement range of 1 to 100 mils.
 4. Frequency range of at least 0 to 1000 Hz.
 5. Capable of filtering unwanted frequencies.
- B. Calibrate the vibration meter before each day of testing.
1. Use a calibrator provided with the vibration meter.
 2. Follow vibration meter and calibrator manufacturer's calibration procedures.
- C. Perform vibration measurements when other building and outdoor vibration sources are at a minimum level and will not influence measurements of equipment being tested.
1. Turn off equipment in the building that might interfere with testing.
 2. Clear the space of people.
- D. Perform vibration measurements after air and water balancing and equipment testing is complete.
- E. Clean equipment surfaces in contact with the vibration transducer.
- F. Position the vibration transducer according to manufacturer's written instructions and to avoid interference with the operation of the equipment being tested.
- G. Measure and record vibration on rotating equipment over 3 hp.
- H. Measure and record equipment vibration, bearing vibration, equipment base vibration, and building structure vibration. Record velocity and displacement readings in the horizontal, vertical, and axial planes.
1. Fans and HVAC Equipment with Fans

- a. Fan Bearing: Drive end and opposite end.
 - b. Motor Bearing: Drive end and opposite end.
 - c. Equipment Casing: Top and side.
 - d. Equipment Base: Top and side.
 - e. Building: Floor.
 - f. Ductwork: To and from equipment after flexible connections.
 - g. Piping: To and from equipment after flexible connections.
- I. For equipment with vibration isolation, take floor measurements with the vibration isolation blocked solid to the floor and with the vibration isolation floating. Calculate and report the differences.
- J. Inspect, measure, and record vibration isolation:
1. Verify that vibration isolation is installed in the required locations.
 2. Verify that installation is level and plumb.
 3. Verify that isolators are properly anchored.
 4. For spring isolators, measure the compressed spring height, the spring OD, and the travel-to-solid distance.
 5. Measure the operating clearance between each inertia base and the floor or concrete base below. Verify that there is unobstructed clearance between the bottom of the inertia base and the floor.

3.17 PROCEDURES FOR SOUND-LEVEL MEASUREMENTS

- A. Perform sound-pressure-level measurements with a sound meter complying with IEC 651, Type 1 or 2, set to an "A" weighting and "slow" meter response.
- B. Calibrate sound meters before each day of testing. Use a calibrator provided with the sound meter complying with ANSI S1.40 and that has NIST certification.
- C. Use a microphone that is suitable for the type of sound levels measured. For areas where air velocities exceed 100 fpm (0.51 m/s), use a windscreen on the microphone.
- D. Perform sound-level testing after air and water balancing and equipment testing are complete.
- E. Close windows and doors to the space.
- F. Perform measurements when the space is not occupied and when the occupant noise level from other spaces in the building and outside are at a minimum.
- G. Clear the space of temporary sound sources so unrelated disturbances will not be measured. Position testing personnel during measurements to achieve a direct line-of-sight between the sound source and the sound-level meter.
- H. Take sound measurements at a height approximately 60 inches above the floor and at least 36 inches from a wall, column, and other large surface capable of altering the measurements.
- I. Take sound measurements in dBA and in each of the 8 unweighted octave bands in the frequency range of 63 to 8000 Hz.
- J. Take sound measurements with the HVAC systems off to establish the background sound levels and take sound measurements with the HVAC systems operating.
 1. Calculate the difference between measurements. Apply a correction factor depending on the difference and adjust measurements.

- K. Perform sound testing for each occupied space. For each space tested, select a measurement location that has the greatest sound level. When testing multiple locations for each space type, select at least one location that is near and at least one location that is remote from the predominant sound source.

3.18 PROCEDURES FOR SMOKE EXHAUST SYSTEM TESTING

- A. Before testing smoke-extract systems, verify that construction is complete and verify the integrity of each smoke extract zone boundary. Verify that windows and doors are closed and that applicable safing, gasket, and sealants are installed. Verify the boundaries of each smoke extract zone and the proper operation of all related dampers. Report deficiencies and postpone testing until after the reported deficiencies are corrected.
- B. Measure and record wind speed and direction, outside-air temperature, and relative humidity on each test day.
- C. Measure, adjust, and record airflow of each smoke extract system with all fans that are a part of the system operating as intended by the design.
- D. Measure, adjust, and record the airflow of each fan and static pressure profile as specified above. For ducted systems, measure the fan airflow by duct Pitot-tube traverse. For non-ducted fans or inlets/outlets provide temporary ducts/hoods to conduct measurement.
- E. After air balancing is complete, perform the volume testing for each smoke extract zone in the system.
1. Each system shall provide 6 ach^{-1} of exhaust from its zone above and below ceilings. Make-up air shall be introduced as shown on the drawings. Refer to drawings for smoke extract volumes.
- F. Operational Tests:
1. Check the proper activation of each zoned smoke extract system in response to manual start signal from the smoke control panel (scp).
 2. Check and record the proper operation of fans, dampers, make-up air path devices, and related equipment for each separate zone of the smoke extract system. Include test of the following:
 - a. Auxiliary functions to achieve the smoke extract system configuration such as changes or override of normal operating fan conditions and temperature-control functions, damper positions and set points.
 - b. Test to verify that the system functions while operating under both normal and standby power.
- G. Conduct additional tests required by authorities having jurisdiction. Unless required by authorities having jurisdiction, perform testing without the use of smoke or products that simulate smoke.
- H. Prepare a complete report of observations, measurements, and deficiencies.

3.19 PROCEDURES FOR INDOOR-AIR QUALITY MEASUREMENTS

- A. After air balancing is complete and with HVAC systems operating at indicated conditions, perform indoor-air quality testing.

- B. Observe and record the following conditions for each HVAC system:
1. The distance between the outside-air intake and the closest exhaust fan discharge, flue termination, or vent termination.
 2. Specified filters are installed. Check for leakage around filters.
 3. Cooling coil drain pans have a positive slope to drain.
 4. Cooling coil condensate drain trap maintains an air seal.
 5. Evidence of water damage.
 6. Insulation in contact with the supply, return, and outside air is dry and clean.
- C. Make measurements at multiple locations served by the system if required to satisfy the following:
1. At least one test location per air handling unit.
 2. Where air handling units serve multiple rooms conduct tests for a minimum of three spaces per air handling unit.
- D. Measure and record the following indoor conditions for each location specified two times at two-hour intervals, and in accordance with ASHRAE 113:
1. Temperature.
 2. Relative humidity.
 3. Air velocity.
 4. Concentration of carbon dioxide (ppm).
 5. Concentration of carbon monoxide (ppm).
 6. Nitrogen oxides (ppm).
 7. Formaldehyde (ppm).

3.20 BUILDING CONTROL SYSTEM VERIFICATION

- A. Verify that controllers are correctly wired, calibrated and commissioned.
- B. Check transmitter and controller locations and note conditions that would adversely affect control functions.
- C. Check the operation of limiting controllers (i.e., high- and low-temperature controllers).
- D. Check free travel and proper operation of control devices such as damper and valve operators.
- E. Check the sequence of operation of control devices in all modes of operation. Note device positions and correlate with airflow and water flow measurements. Note the speed of response to input changes.
- F. Check the interaction of electrically operated switch transducers.
- G. Check the interaction of interlock and lockout systems.
- H. Record voltages of power supply and controller output. Determine whether the system operates on a grounded or nongrounded power supply.
- I. Note operation of electric actuators using spring return for proper fail-safe operations.
- J. Upon completion of the Building Control System completely check out and field test hardware and software to assure that the complete system performs in accordance with the approved sequences of operation. Test all equipment and control functions for proper automatic and

manual activation. Test each system and zone for proper operation through its complete heating and cooling cycles.

K. Include the specific tests and control functions listed below:

1. Full point check.
2. Smoke extract strategy.
3. Manual activation of each fan and smoke and fire/smoke damper.
4. System priorities and overrides.
5. Trouble, monitoring and annunciation capability.
6. Power resumption response.
7. System failure response, including emergency power operation.
8. All user notification messages.
9. All controls loops shall be verified as operating in a stable manner with no hunting prior to the start of the commissioning process.

3.21 TOLERANCES

- A. Set HVAC system airflow and water flow rates within the tolerances specified above.

3.22 REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.23 FINAL REPORT

- A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.
- B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.
1. Include a list of instruments used for procedures, along with proof of calibration.
- C. Final Report Contents: In addition to certified field report data, include the following:
1. Pump curves with operating points.
 2. Fan curves with operating points.
 3. Manufacturers' test data.
 4. Field test reports prepared by system and equipment installers.
 5. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.

D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:

1. Title page.
2. Name and address of TAB firm.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB firm who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer, type size, and fittings.
14. Notes to explain why certain final data in the body of reports varies from indicated values.
15. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outside-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Fan drive settings including settings and percentage of maximum pitch diameter.
 - e. Settings for supply-air, static-pressure controller.
 - f. Other system operating conditions that affect performance.

E. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outside, supply, return, and exhaust airflows.
2. Water flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

F. Fan Coil Unit Test Reports: For fan coil units with coils, include the following:

1. Unit Data: Include the following:
 - a. Unit identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Unit arrangement and class.
 - g. Discharge arrangement.

- h. Sheave make, size in inches, and bore.
 - i. Sheave dimensions, center-to-center, and amount of adjustments in inches.
 - j. Number of belts, make, and size.
 - k. Number of filters, type, and size.
2. Motor Data
- a. Make and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Sheave dimensions, center-to-center, and amount of adjustments in inches.
3. Test Data (Indicated and Actual Values)
- a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Filter static-pressure differential in inches wg.
 - f. Preheat coil static-pressure differential in inches wg.
 - g. Cooling coil static-pressure differential in inches wg.
 - h. Heating coil static-pressure differential in inches wg.
 - i. Outside airflow in cfm.
 - j. Return airflow in cfm.
 - k. Outside-air damper positions.
 - l. Return-air damper positions.

G. Apparatus-Coil Test Reports:

1. Coil Data:
- a. System identification.
 - b. Location.
 - c. Coil type.

 - d. Number of rows.
 - e. Fin spacing in fins per inch o.c.
 - f. Make and model number.
 - g. Face area in sq. ft.
 - h. Tube size in NPS.
 - i. Tube and fin materials.
 - j. Circuiting arrangement.
2. Test Data (Indicated and Actual Values):
- a. Airflow rate in cfm.
 - b. Average face velocity in fpm.
 - c. Air pressure drop in inches wg.
 - d. Outside-air, wet- and dry-bulb temperatures in deg F.
 - e. Return-air, wet- and dry-bulb temperatures in deg F.
 - f. Entering-air, wet- and dry-bulb temperatures in deg F.
 - g. Leaving-air, wet- and dry-bulb temperatures in deg F.
 - h. Water flow rate in gpm.
 - i. Water pressure differential in feet of head or psig.

- j. Entering-water temperature in deg F.
 - k. Leaving-water temperature in deg F.
- H. Fan Test Reports: For supply, return, and exhaust fans, include the following:
- 1. Fan Data
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and size.
 - e. Manufacturer's serial number.
 - f. Arrangement and class.
 - g. Sheave make, size in inches, and bore.
 - h. Sheave dimensions, center-to-center, and amount of adjustments in inches.
 - 2. Motor Data
 - a. Make and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Sheave dimensions, center-to-center, and amount of adjustments in inches.
 - g. Number of belts, make, and size.
 - h. Test Data (Indicated and Actual Values):
 - i. Total airflow rate in cfm.
 - j. Total system static pressure in inches wg.
 - k. Fan rpm.
 - l. Discharge static pressure in inches wg.
 - m. Suction static pressure in inches wg.
- I. Round and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
- 1. Report Data
 - a. System and air-handling unit number.
 - b. Location and zone.
 - c. Traverse air temperature in deg F.
 - d. Duct static pressure in inches wg.
 - e. Duct size in inches.
 - f. Duct area in sq. ft.
 - g. Indicated airflow rate in cfm.
 - h. Indicated velocity in fpm.
 - i. Actual airflow rate in cfm.
 - j. Actual average velocity in fpm.
 - k. Barometric pressure in psig.
- J. Air-Terminal-Device Reports:
- 1. Unit Data
 - a. System and air-handling unit identification.
 - b. Location and zone.

- c. Test apparatus used.
 - d. Area served.
 - e. Air-terminal-device make.
 - f. Air-terminal-device number from system diagram.
 - g. Air-terminal-device type and model number.
 - h. Air-terminal-device size.
 - i. Air-terminal-device effective area in sq. ft.
2. Test Data (Indicated and Actual Values)
 - a. Airflow rate in cfm.
 - b. Air velocity in fpm.
 - c. Preliminary airflow rate as needed in cfm.
 - d. Preliminary velocity as needed in fpm.
 - e. Final airflow rate in cfm.
 - f. Final velocity in fpm.
 - g. Space temperature in deg F.
- K. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:
1. Unit Data
 - a. System and air-handling unit identification.
 - b. Location and zone.
 - c. Room or riser served.
 - d. Coil make and size.
 - e. Flowmeter type.
 2. Test Data (Indicated and Actual Values)
 - a. Airflow rate in cfm.
 - b. Entering-water temperature in deg F.
 - c. Leaving-water temperature in deg F.
 - d. Water pressure drop in feet of head or psig.
 - e. Entering-air temperature in deg F.
 - f. Leaving-air temperature in deg F.
- L. Vibration Measurement Reports
1. Date and time of test.
 2. Vibration meter manufacturer, model number, and serial number.
 3. Equipment designation, location, equipment, speed, motor speed, and motor horsepower.
 4. Diagram of equipment showing the vibration measurement locations.
 5. Measurement readings for each measurement location.
 6. Calculate isolator efficiency using measurements taken.
 7. Description of predominant vibration source.
- M. Sound Measurement Reports: Record sound measurements on octave band and dBA test forms and on an NC or RC chart indicating the decibel level measured in each frequency band for both "background" and "HVAC system operating" readings. Record each tested location on a separate NC or RC chart. Location shall be noted and keyed to plans. Record the following on the forms:

1. Date and time of test. Record each tested location on its own NC curve.
2. Sound meter manufacturer, model number, and serial number.
3. Space location within the building including floor level and room number.
4. Diagram or color photograph of the space showing the measurement location.
5. Time weighting of measurements, either fast or slow.
6. Description of the measured sound: steady, transient, or tonal.
7. Description of predominant sound source.

N. Indoor-Air Quality Measurement Reports for Each HVAC System:

1. HVAC system designation.
2. Date and time of test.
3. Outdoor temperature, relative humidity, wind speed, and wind direction at start of test.
4. Room number or similar description for each location.
5. Measurements at each location.
6. Observed deficiencies.

O. Instrument Calibration Reports

1. Report Data
 - a. Instrument type and make.
 - b. Serial number.
 - c. Application.
 - d. Dates of use.
 - e. Dates of calibration.

P. Smoke Exhaust System Reports

1. Smoke Exhaust zone and all fans used in extract and make-up.
2. Date and time of test.
3. Outdoor temperature, relative humidity, wind speed, and wind direction at start of test.
4. Air volume removed from zone, above ceiling and below ceiling.
5. Make-up air volume delivered by active make-up air systems.
6. Fan speed, amp draw for each fan.
7. Damper positions for all dampers, in zone being extracted and other zones.
8. Make-up air door position.
9. Correct functioning of smoke extract control panel for interlocks for each zone activation.

Q. Outside Air Volume and Space Pressurization Reports

1. Report by HVAC zone, i.e. air handling unit area served including all exhaust fans.
2. Outside air volumes used in the system in each operating mode specified to be tested.
3. Exhaust air volumes of each fan operated in test.
4. Positive pressurization achieved in each operating mode with each exhaust fan operating with sequential starts.

R. Miscellaneous Equipment Reports

1. Include unit heaters, fan coils, cabinet heaters, etc.
2. All air, water, fan, motor and controller data specified above.

3.24 INSPECTIONS

A. Initial Inspection

1. After testing and balancing are complete, and the 72-hour test has been successfully completed, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the Final Report. Advise Owner 5 days in advance of check tests.
2. Randomly check the following for each system:
 - a. Measure airflow of at least 10 percent of air outlets.
 - b. Measure water flow of at least 5 percent of terminals.
 - c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
 - d. Measure sound levels at 15 locations.
 - e. Measure space pressure of at least 10 percent of locations.
 - f. Verify that balancing devices are marked with final balance position.
 - g. Note deviations to the Contract Documents in the Final Report.

B. Final Inspection

1. After initial inspection is complete and evidence by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Owner.
2. TAB firm test and balance engineer shall conduct the inspection in the presence of Owner.
3. Owner shall randomly select measurements documented in the final report to be rechecked. The rechecking shall be limited to 15 percent of the total measurements recorded in the TAB process.
4. If the rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 15 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
6. Tab firm shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes and resubmit the final report.
7. Request a second final inspection. If the second final inspection also fails, Owner shall contract the services of another TAB firm to complete the testing and balancing in accordance with the Contract Documents and deduct the cost of the services from the final payment.

END OF SECTION 23 05 93

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SECTION 23 07 00 - HVAC INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide and install complete systems of insulation for all new piping and equipment as shown and specified.

1.2 QUALITY ASSURANCE

- A. Insulation materials and accessories furnished and installed hereunder shall, where required, be accompanied by manufacturers' current submittal or data sheets showing compliance with applicable specifications listed here.
- B. Insulation materials and accessories shall be installed in a workmanlike manner by skilled and experienced workers who are regularly engaged in commercial insulation work.
- C. Insulation materials, including all weather and vapor barrier materials, closures, hangers, fitting covers and other accessories, shall be furnished and installed in strict accordance with project drawings, plans and specifications. Work not in accordance with these Specifications, damaged, or incorrectly installed shall be removed and/or repaired and replaced as directed.
- D. Mockups:
 - 1. Before installing piping systems, build mockups representing primary and secondary chilled water systems in steel, copper, and PP piping with insulation for the following:
 - a. Horizontal piping in individual hangers, trapeze hanger, metal framing system, and thermal hanger shield inserts.
 - b. Vertical piping.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.3 REFERENCE STANDARDS:

- A. Thermal insulation materials shall meet the property requirements of one or more of the following specifications as applicable to the specific product or use:
 - 1. American Society for Testing of Materials Specifications:
 - a. ASTM C 547, "Standard Specification for Mineral Fiber Pipe Insulation"
 - b. ASTM C 553, "Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications"
 - c. ASTM C 585, "Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System)"
 - d. ASTM C 612, "Standard Specification for Mineral Fiber Block and Board Thermal Insulation"
 - e. ASTM C 795, "Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel"
 - f. ASTM C 1136, "Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation"

- g. ASTM C 1290, "Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts"
- h. ASTM G 21, "Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi" (fungi resistance section only)
- i. ASTM G 22, "Practice for Determining Resistance of Plastics to Bacteria (bacteria resistance section only)
- j. ASTM - American Society for Testing and Materials
 - 1) E-84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- k. ASTM E1222-90, "Standard Test Method for Laboratory Measurement of the Insertion Loss of Pipe Lagging Systems"
- 2. Federal Specification: a. HH-I-558B, "Insulation Blocks, Boards, Blankets, Felts, Sleeving (Pipe and Tube Covering), and Pipe Fitting Covering, Thermal (Mineral Fiber, Industrial Type)" (Obsolete)
- 3. Military Specifications:
 - a. MIL-I-22344C, "Insulation, Pipe, Thermal, Fibrous Glass"
 - b. MIL-I-24244D(SH), "Insulation Materials with Special Corrosion, Chloride, and Fluoride Requirements"
- 4. U. S. Coast Guard Specification:
 - a. Approval #164.009, "Noncombustible Materials"
- 5. ASC - Adhesive and Seal Council
 - a. ASC-A-7001C Standards for Adhesives for Duct Liner.
- 6. SMACNA - Sheet Metal and Air Conditioning Contractors National Association Inc.
 - a. Duct Liner Application Standard.
 - b. Mechanical Fastener Standard HF-1.
- 7. UL - Underwriters Laboratories Inc.
 - a. 723 Tunnel Test.
- 8. NAIMA - North American Insulation Manufacturer's Association "Fibrous Glass Duct Linear Standard"
- 9. Requirements of Regulatory Agencies:
 - a. NFPA - National Fire Protection Association
 - 1) 90A, Air Conditioning and Ventilating Systems.
 - 2) 90B, Warm Air Heating and Air Conditioning Systems.

B. Insulation systems shall include:

- 1. Piping insulation, jacketing and accessories.
- 2. Equipment insulation and jacketing and coating and accessories.
- 3. Ductwork insulation and jacketing lining and accessories.

4. Firestopping
5. Accessories

1.4 SUBMITTALS

- A. Manufacturer's Data indicating product description and installation instructions.
 1. Insulation Materials.
 2. Adhesives.
 3. Fastening Devices.
 4. Vapor Barriers.
 5. Jackets.
- B. LEED Submittal:
 1. Product Data for Credit EQ 4.1: For adhesives and sealants, including printed statement of VOC content.
- C. Submit schedules of types, thickness, jacketing and accessories for application and location.
- D. Submit materials safety sheets for all adhesives.

1.5 DEFINITIONS

- A. The term "mineral fiber" as defined by the above specifications includes fibers manufactured of glass, rock, or slag processed from a molten state, with or without binder.

1.6 SYSTEM PERFORMANCE

- A. Insulation materials furnished and installed under this specification should meet the minimum requirements of the 2010 Energy Conservation Construction Code of New York State. However, if other factors such as condensation control or personnel protection are to be considered, the selection of the thickness of insulation should satisfy the controlling factor.
- B. Insulation materials furnished and installed hereunder shall meet the fire hazard requirements of any one of the following specifications:
 1. American Society for Testing of Materials ASTM E 84
 2. Underwriters' Laboratories, Inc UL 723
 3. National Fire Protection Association NFPA 255
- C. Show ratings on products, cartons, labels, etc. or verify by report from an approved independent testing laboratory.
 1. Flamespread: Minimum 25
 2. Fuel contributed and smoke developed: Maximum 50
- D. Flame proofing treatments subject to deterioration due to moisture or humidity are not acceptable.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Maintain manufacturer's recommend temperatures and conditions for tapes, adhesives, and cements.

1.8 DELIVERY AND STORAGE OF MATERIALS

- A. All of the insulation materials and accessories covered by this specification shall be delivered to the job site and stored in a safe, dry place with appropriate labels and/or other product identification.
- B. The contractor shall use whatever means are necessary to protect the insulation materials and accessories before, during, and after installation. No insulation material shall be installed that has become damaged in any way. The contractor shall also use all means necessary to protect work and materials installed by other trades.
- C. If any insulation material has become wet because of transit or job site exposure to moisture or water, the contractor shall remove it from the job site and replace it with no increase to the Contract Sum.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Fiberglass Insulation:
 - 1. The Manville Corp.
 - 2. Owens-Corning Fiberglas Corp.
 - 3. Certain-Teed
- B. Flexible Elastomeric Insulation:
 - 1. The Manville Corp.
 - 2. Armstrong
 - 3. Halstead
- C. Calcium Silicate Insulation:
 - 1. The Manville Corp.
 - 2. Owens-Corning Fiberglas Corp.
 - 3. Pabco.
- D. Styrofoam Insulation: Dow FR or FB.
- E. Fiberglass Pre-molded Pipe Fitting Covers Insulation:
 - 1. Insul-Coustic/Birma Products Co.
 - 2. Childers Products Co.
 - 3. Speedline
 - 4. Zeston
- F. Adhesives
 - 1. Benjamin Foster
 - 2. Insul-Coustic
 - 3. 3M
 - 4. Childers Products Co.
 - 5. Miracle

G. Weld Pins:

1. Nelson Stud Welding Div. TRW Inc.
2. Duro-Dyne Corporation
3. Miracle
4. Tuff-Weld
5. Grip Nail

H. Jacketing

1. All service jacketing by insulation manufacturer
2. PVC jacketing by insulation manufacturer.

2.2 MATERIALS

A. Jackets and Coverings:

1. 0.016-inch stainless steel smooth surface with moisture barrier.
2. 0.016-inch aluminum smooth surface with moisture barrier.
3. All service jacket laminate (ASJ):
 - a. Aluminum foil vapor retarder.
 - b. Glas-Scrim reinforcing.
 - c. Kraft paper backing.
 - d. Double adhesive longitudinal jacket lap seal, two component butt strip seal. (SSL)
4. PVC Plastic Jacket
 - a. Jacket: (ASTM C921). One piece molded type fitting covers and sheet material, off white color (Manville Zeston 2000)
 - (1) Minimum Service Temperature: -40 degrees F.
 - (2) Maximum Service Temperature: 150 degrees F.
 - (3) Moisture Vapor Transmission: ASTM E96; 0.002 perm inches
 - (4) Maximum Flame Spread: ASTM E84; 25.
 - (5) Maximum Smoke Developed: ASTM E84; 50.
 - (6) Thickness: 20 mil
 - b. Connections of brush-on welding adhesive or pressure sensitive color matching vinyl tape.
5. Canvas Jacket: UL listed fabric, 6 oz/sq yd (220g/sq m), plain weave cotton treated with dilute fire retardant lagging adhesive.

B. Adhesives and Coatings:

1. Foster Product Names and Figure Numbers or equal as follows:
 - a. Lagging Adhesive: 30-36 UL label.
 - b. Vapor-Barrier Coating: Tite-fit 30-35 UL label.
 - c. Vaporseal Adhesive: Spark-fas 85-20 UL label.
 - d. Duct Adhesive: Spark-fas 85-20 UL label.
 - e. Outdoor Mastic: Monolar mastic 60-38 UL label.

C. Wire, Banding, and Fastening Devices:

1. Manufacturers: Pabco, Marathon, Vimesco, Ideal or Venture.
2. Tie Wire: 18 gauge stainless steel with twisted ends on maximum 12 inch centers.
3. Bands: 3/4-inch nominal width wing seals, of minimum thickness as follows:
 - a. Aluminum: 0.007 inch indoors. Where exposed to weather, 0.020 inch.
 - b. Stainless Steel: 0.010 inch.
4. Staples: Outward clinching type of corrosion-resistant steel.
5. Weld pins to Support and Fasten Duct Insulation: Minimum 1/8- speed washer or integral flange of minimum 1-3/8 inches diameter.

D. Piping Insulation: Refer to types below and schedule.

1. Where type is not shown, provide: Type P-1 for service up to 350 degrees F.
2. Type P-1: Fiberglass:
 - a. Molded: Heavy density fiberglass, maximum 0.24 (Btu-in/h/SF/degF) K factor at 100 degrees F mean rating temperature. 0.02 perms, maximum 500 degrees F. Reinforced white kraft and aluminum foil laminate vapor barrier all service jacket (ASJ), self-seal double adhesive lap (SSL), vapor sealed.
3. Type P-2: Fiberglass:
 - a. As Type P-1 and with aluminum or stainless steel jacketing
4. Type P-3:
 - a. As Type 1 and with PVC jacketing
5. Type P-4: Calcium silicate:
 - a. Rigid, molded asbestos free, 0.40 K factor at 300 degrees F. Maximum service 1200 degrees F, all service jacket (ASJ), 14 PCF, not damaged by water compressive strength of 100 psi to produce 5% compression, 100 psi.
6. Type P-5: Flexible elastomeric insulation:
 - a. $K=0.28$ at 75 degrees F mean temperature, 6 PCF density, 0.20 perm-in. maximum, water absorption one percent volume, ten percent weight.
7. Type P-6: Trap and riser protection:
 - a. Polyurethane 1-inch Dow TRYMER 2000 styrofoam, all service or all purpose jacket, vapor-sealed.
8. Insulation for fittings and valves:
 - a. Pre-molded PVC fiberglass fitting covers or radial mitered sections of pipe insulation type specified.
 - b. For piping insulated with materials other than fiberglass use radial mitered sections of pipe insulation or built-up pipe insulation and finishing cement.

E. Ductwork, Casings, Housings and Plenums Insulation: Type as scheduled for services listed.

1. Type DW: Flexible fibrous glass blanket with vapor barrier.
 - a. 1-DW: Manville "Standard" Microlite, 1-1/2 inch thick duct wrap. Thermal conductivity at 75 degrees F mean, $K=0.26$ BTU/hr.-degrees F/inch installed "R" 4.5, 1 pcf.
 - b. 2-DW: Manville "Standard" Microlite, 2 inch thick duct wrap, thermal conductivity at 75 degrees F mean, $K=0.26$ BTU/hr.-degrees F/inch installed "R" 6.0, 1 pcf.
 - c. 3-DW: Manville "Spin-Glas" 1-1/2 inch thick rigid board duct wrap, 4.25 pounds per cubic foot, glass cloth and mastic. Thermal conductivity at 75 degrees F mean, $K=0.23$ BTU/hr.-degrees F/inch.
 - d. 4-DW: Manville "814 Spin-Glas" 2 inch thick rigid board duct wrap, 4.25 pounds per cubic foot, glass cloth and mastic, aluminum paint. Thermal conductivity at 75 degrees F mean, $K=0.23$ BTU/hr.-degrees F/inch.
 - e. Factory applied jacket on each of the above:
 - 1) Foil-scrim-kraft laminate (FSK):
 - a) Aluminum foil facing.
 - b) Glass scrim reinforcing.
 - c) Kraft paper backing.
 - 2) Maximum vapor permeance: 0.02 perms.
 - 3) One 2 inch flange, vapor sealed.
 - f. Minimum insulation as noted above and to comply with the 2010 Energy Conservation Construction Code of New York State. In the absence of more stringent requirements provide minimum R-value R-5 for ductwork indoors and R-8 for ductwork outdoors.
2. Please refer to section 233113 Metal Ducts for duct liner requirements.

F. Equipment Insulation Types:

1. Type E-1:
 - a. Fiberglass board.
 - b. Thickness as scheduled.
 - c. 3 pounds per cubic foot density.
 - d. Foil-scrim-kraft facing.
 - e. Vapor-sealed.
 - f. $K=0.23$ at 75F mean.
 - g. Aluminum jacket banded in place.
 - h. Segmented or scored for curved surface.
2. Type E-2:
 - a. Fiberglass board.
 - b. Thickness as scheduled.
 - c. 6-pound per cubic foot density.
 - d. Segmented or scored for curved surfaces.
 - e. $K=0.22$ at 75F mean.
 - f. Foil-scrim-kraft facing.

- g. Vapor-sealed.
 - h. Aluminum jacket banded in place.
3. Type E-3:
- a. Elastomeric closed cell.
 - b. Thickness as scheduled.
 - c. Aluminum or stainless steel jacket banded in place.
4. Type E-4:
- a. Calcium-silicate blocks.
 - b. Thickness as scheduled.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Provide insulation as required for all packaged equipment whether furnished with equipment or not.
2. Before applying insulation:
 - a. Test piping and ductwork for tightness; obtain review and acceptance.
 - b. Clean surfaces of dust, grease, rust, extra flux and foreign matter.
 - c. Ensure surface is clean and dry before application. Ensure insulation is dry before and during installation.

B. Piping:

1. Insulation to be continuous using full length sections of pre-molded insulation only. Multiple short length sections on straight piping shall not be accepted. Butt edges neatly, ASJ jacket with 3-inch minimum butt strips.
2. Fill voids with insulating cement.
3. Longitudinal Overlaps:
 - a. 2 inches minimum, self-sealing, double adhesive.
 - b. For exposed work: place overlap facing toward ceiling or wall.
4. Continuous insulation passing through sleeves or other openings, except underground sleeves.
5. Install Metal frames to protect edges of openings in insulation.
6. Valves, Fittings, Flanges and Accessory Insulation:
 - a. Unless otherwise shown or specified, insulate:
 - 1) Valves, including bonnets.
 - 2) Flanges.
 - 3) Fittings.
 - 4) Strainers.
 - 5) Expansion joints.
 - 6) All specialties.

- b. Insulation for Strainers, Expansion Joints, Fittings, and Accessories Requiring Servicing or Inspection:
 - 1) Insulation removable and replaceable without damage.
 - 2) Enclose within two piece, No. 18 gauge aluminum covers fastened with cadmium-plated bolts and nuts.
 - c. Insulation of same thickness as that of adjacent piping insulation.
 - d. For piping systems insulated with fiberglass use wired-on pre-molded fiberglass fitting covers or mitered segments of pipe insulation. Vapor barrier shall be continuous.
 - e. For piping systems insulated with calcium silicate:
 - 1) Wire on pre-molded sections of calcium silicate fittings covers.
 - 2) Under 3-inch pipe size, built up coating of insulating and finishing cement to match thickness of adjoining pipe insulation may be used.
 - 3) For exposed locations only, apply skim coat of finishing cement to smooth out surface of fitting insulation.
 - f. Flanges: Insulation sleeve of same material as pipe insulation, to cover flange and overlap insulation on adjacent piping.
 - 1) For calcium silicate insulation provide calcium silicate rings between sleeve and pipe insulation.
7. At pipe hangers:
- a. Insulation protection saddles and shields specified in Section 230529
 - b. Embed no hangers in insulation.
 - c. At saddles use 360 degree calcium silicate insulation of same length as saddle where fiberglass is used, or of type specified for service where rigid insulation is used.
8. At fire- and smoke-rated wall and floor penetrations:
- a. Bare pipe: Use Pipe Shields Model "F" series. Encase pipe penetrating fire- or smoke-rated walls and floors in adjoining sheet metal cans, 24 gauge minimum, sized for maximum 1-inch space between pipe and can. Pack space on either end with Manville Cerra-felt positively fastened.
 - b. Insulated pipe: Use Pipe Shields Model "F2000" series for chilled water and refrigerant lines. All other insulated lines use PSI Model "F1000" series.
 - c. Encase all pipes penetrating fire- and smoke-rated walls and floors in adjustable or fixed length metal cans, 24 gauge minimum, sized for maximum 1-inch space between insulation and can. Insulation shall consist of a 360-degree waterproofed calcium silicate insert sized to extend to a minimum of 1 inch beyond wall or floor penetration. Calcium silicate insert shall be the same thickness as that of adjoining pipe insulation. Pack space between shield and can on either end with Manville Cerra-felt positively fastened. Extend insulation insert beyond sheet metal shield on all chilled-water refrigerant lines.
9. Insulation as specified herein shall be applied to all new piping and to existing piping being re-located where existing insulation is damaged.
- C. Jackets and Facings:

1. Vaporsealed types: Continuous. Staples not permitted.
 2. For piping:
 - a. Seal longitudinal laps.
 - b. Adhere 3-inch wide joint strip, of same material as facing, at center of each butt joint.
 - c. Adhesives:
 - 1) Vaporsealed insulation: Vaporseal adhesive.
 - 2) Heating service insulation: Vaporseal adhesive.
 - d. Exposed to weather: Metal and canvas jackets as specified.
 3. For ducts, plenums, casings, housings, and equipment:
 - a. Vaporseal fibrous glass blanket:
 - 1) 2-inch lap strip at one end.
 - 2) Peel insulation for 2-inch lap strip along longitudinal joints.
 - 3) Seal lap strips with vaporseal adhesive.
 - b. Fibrous glass board: Seal joints and breaks in facings with 4-inch wide tape to match facing and adhere with vapor seal adhesive.
- D. Adhesives and Coatings:
1. Apply in accordance with manufacturer's recommendations.
 2. Adhere jackets and facings with wet coat of adhesive.
 3. Lap sealing: 4 inches.
 4. Surfaces to be adhered: Completely coated with adhesive.
- E. Wiring, Banding, and Fastening Devices:
1. Secure insulation to piping, ductwork and equipment in accordance with the following minimum requirements:
 - a. Piping insulation section 3 feet long.
 - 1) Concealed vaporsealed insulation banded at ends and center.
 - 2) Other concealed insulation banded at ends and center.
 - b. Piping fittings insulation:
 - 1) Loops of wire to secure mitered segments of insulation and pre-molded fitting covers.
 - c. Outdoor piping:
 - 1) Band weatherproof metal jackets at each circumferential joint and center of each 3-foot section.
 - 2) Set bands in mastic.
 - 3) Caulk joints vaportight.
 - d. Ductwork mechanical fasteners:

- 1) Weld pins or grip nails.
- 2) Spacing: Minimum 12 inch centers and minimum 2 rows per side of duct.
- 3) Maximum permissible load:
 - a) 5 pounds for 2 inch by 2 inch baseplate.
 - b) 10 pounds for 2-3/4 inch by 2-3/4 inch baseplate.
- 4) Clip off pin penetrations flush with insulation surface or facing.
- 5) Seal pins and washers:
 - a) With 2 inch square pieces of vapor barrier material to match facing.
 - b) Adhere with vaporseal adhesive.

e. Equipment insulation:

- 1) General:
 - a) Apply insulation with edges tightly butted, joints staggered and secure in place by steel bands. Where necessary weld on suitable anchors.
 - b) Provide sufficient clearance around openings for normal operation.
 - c) Finish hot surface insulation with 1 inch galvanized hexagonal mesh and coat with hydraulic setting insulation cement.
 - d) Finish cold surface insulation joints with 4 inch wide strips of vapor barrier sealed with vapor barrier adhesive. Finish insulation with heavy coat of vapor barrier mastic applied over whole body.
 - e) Finish with final coat of cement containing 25 percent by weight of Portland cement.
 - f) Recover and provide extra coat of lagging adhesive.
- 2) Rigid board with vapor barrier:
 - a) Application:
 - (1) Impale insulation on weld pins for flat surfaces.
 - (2) Band in place on irregular surfaces with 16 gauge galvanized annealed wire on maximum 9 inch centers.
 - (3) Apply 1/4-inch coat of insulating and finishing cement filling all voids.
 - (4) Secure lightweight glass cloth with adhesive over cement.
 - b) Special considerations:
 - (1) Chilled water pump volutes:
 - (2) Construct box of minimum 22 gauge galvanized sheet metal angles.
 - (3) Build in solid insulation panels with vapor barrier using adhesives and vapor barrier tape.
 - (4) Provide insulated removable sheet metal covers above volute, for bearing replacement gasket and seal.
 - (5) For split case pump section above top case of pump.
- 3) Calcium silicate blocks:
- 4) Application:

- a) Securely band blocks, tightly butted, and joints evenly staggered with 16 gauge galvanized annealed steel wire on maximum 9 inch centers.
 - b) Provide weld pins, clips, and angles for anchors.
 - c) Stretch 2 inch hexagonal meshwire on anchors.
 - d) Apply 1/4-inch coat insulating and finishing cement.
 - e) Apply heavyweight glass cloth with foster 30-36 adhesive.
 - f) Apply finish coat of adhesive.
- f. Field quality control: Repair separation of joints or cracking of insulation due to thermal movement or poor workmanship.
- F. Thermal Hanger Shields:
1. Tape all butt joints where pipe insulation butts up against hanger shield. On hot piping, apply 3 inch wide canvas strip dipped in lagging adhesive over the butt joints.
- G. Plenum and Duct Insulation:
1. Comply with published recommendations of manufacturer.
 2. Unless otherwise shown, apply insulation externally.
 3. Ensure insulation is continuous through inside walls.
 - a. Pack around ducts with fireproof self-supporting insulation material. Properly seal.
 4. Finish insulation neatly at hangers, supports and other protrusions.
 5. Locate insulation cover seams in least visible locations.
 6. Where ducts run in groups too close to be individually insulated and finished:
 - a. Completely fill all spaces between ducts with rigid or flexible insulation material.
 - b. Insulate and finish exterior surfaces of groups as specified for particular service.
 7. Where ducts cannot be insulated after erection, insulate prior to installation.
 8. Where specified thickness of insulation exceeds available thickness in single layer, provide insulation in 2 or more layers with joints staggered.
 9. Finish with systems at operating conditions.
 10. Wrap: Duct and plenum wrap.
 - a. Application, rectangular, round and oval duct:
 - 1) Apply the duct wrap over clean, dry sheet metal ductwork that has been sealed airtight at all seams and joints.
 - 2) Install duct wrap to allow maximum fullness at corners. Avoid excessive compression. Minimum thickness at corners is 1 inch.
 - 3) Butt insulation tightly at joints.
 - 4) Secure with 4 inch strips of adhesive at 8 inches on center, 2 inch lap strip at one end.
 - 5) Apply with one hundred percent coverage of adhesive, similar to Foster's 85-15.
 - 6) Overlap vapor barrier facing a minimum of 2 inches. Remove insulation from lap prior to stapling.
 - 7) Staple all vapor barrier seams approximately 6 inches on center with outward clinching staples, and seal lap strips with a foil vapor barrier tape, or vapor barrier mastic, such as 3M No. 35.

- 8) When ducts are over 24 inches in width, additionally secure the duct wrap to the bottom of rectangular ducts with mechanical fasteners spaced on 12-inch centers, but not less than 1 pin on each surface, to prevent sagging of insulation.
 - 9) Seal penetration of facing to provide a vapor tight system.
- b. Duct and plenum rigid board wrap:
- 1) In addition to above general requirements:
 - a) Score insulation to cover standing seams.
 - b) Secure with mechanical fasteners spaced 16 inches on centers or closer as required to hold insulation firmly to duct.
 - c) Seal all joints and pin penetrations with pressure sensitive aluminum foil tape. Reinforce all exposed edges with corner bead.
11. Insulation as specified herein shall be applied to all new ductwork, plenums, etc. and to existing ductwork, etc., where existing insulation is damaged.
12. Install fire wrap as specified by the manufacturer and in accordance with all stated direction.

3.2 SCHEDULE: PIPES AND EQUIPMENT

	Service	Type	Size (Inches)	Thickness (Inches)
A.	Any pressure heating hot water supply and return with fluid operating range of 105 deg F – 140 deg F	P-1	< 1	0.5
			1 to < 1 ½	0.5
			1 ½ to < 4	1.0
			4 to < 8	1.0
			8 and larger	1.0
1.	All air handling unit and reheat coil valve 3ft upstream and downstream	P-2	< 1	0.5
			1 to < 1 ½	0.5
			1 ½ to < 4	1.0
			4 to < 8	1.0
			8 and larger	1.0

	Service	Type	Size (Inches)	Thickness (Inches)		
B.	Any pressure heating hot water supply and return with fluid operating range of 141 deg F – 200 deg F	P-1	< 1	1.0		
			1 to < 1 ½	1.0		
			1 ½ to < 4	1.0		
			4 to < 8	1.5		
			8 and larger	1.5		
1.	All air handling unit and reheat coil valve 3ft upstream and downstream	P-2	< 1	0.5		
			1 to < 1 ½	0.5		
			1 ½ to < 4	1.0		
			4 to < 8	1.0		
			8 and larger	1.0		
C.	Chilled water supply and return 40 deg F – 60 deg F	1.	Mechanical Rooms	P-3	1 ½ and smaller	1
					2 and larger	1 ½
		2.	Other piping in building	P-1	1 ½ and smaller	1
					2 and larger	1 ½
		3.	Exposed to weather	P-2	1 ½ and smaller	1
					2 and larger	1 ½
		4.	Interior branch runouts 4 feet long or less	P-1	1-1/2 and smaller	1

3.3 DUCT AND PLENUM INSULATION

A. Notes for Insulation Application Schedule:

1. When both insulation and lining have been specified for a specific section of ductwork, the amount of external insulation may be reduced to achieve an overall assembly insulation value (U) equivalent to that of the specified duct insulation.
2. Provide fire-rated duct wrap where specified on the drawing.
 - a. Wrap may be used to extend rating to suitable fire damper location as required only where noted on the drawing or agreed with the Engineer.

B. Application Schedule: Ductwork shall be acoustically lined and/or insulated as follows:

Item	Type
All supply and return air ductwork in the mechanical / penthouse rooms	3-DW
All supply ductwork	1-DW
Other return air ductwork	-
External ductwork	4-DW
Outside air ducts in occupied spaces and mechanical rooms	1-DW
Outside air plenums and exhaust air plenums in mechanical spaces between outside air connection and shut-off damper	1-DW
20 feet upstream and downstream of exhaust fans	1-AL
Plenums (unless noted otherwise)	1-AL
Transfer Ducts (unless noted otherwise)	1-AL
Other Outdoor air ducts.	1-DW
External ductwork	4-DW

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SECTION 230800

COMMISSIONING OF HVAC SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, General Commissioning Requirement and other Division 01 Specification Sections, apply to this section.
- B. The OPR and BOD documentation are included by reference for information only.
- C. Division 01 section "Sustainable Design Requirements (LEED Building)" for additional LEED requirements.

1.2 SUMMARY

- A. This section includes commissioning process requirements for HVAC&R systems, assemblies, and equipment.
- B. Related Sections:
 - 1. Division 01 Section "General Commissioning Requirements" for general commissioning process requirements.
 - 2. Division 23 Heating Ventilation & Air Conditioning

1.3 DESCRIPTION

- A. Commissioning: Commissioning is a systematic process of ensuring that all building systems, including the mechanical and electrical systems, have been installed in the prescribed manner, are functionally checked and capable of being operated and maintained to perform with the design intent and have documentation to support proper installation and operation. The Commissioning Agent (CxA) shall provide the City of New York with an unbiased, objective view of the system's installation, operation and performance. This process does not eliminate or reduce the responsibility of each system designer to provide a complete design or installing subcontractors to provide a finished product. Commissioning is intended to enhance the quality of each system installation, startup and transfer to beneficial use by the City of New York.
- B. Commissioning during the construction phase is intended to achieve the following specific objectives, according to the Contract Documents:
 - 1. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
 - 2. Verify and document proper performance of equipment and systems as per the written procedures.
 - 3. Verify that Operation & Maintenance documentation is complete and transferred to City of New York.
 - 4. Verify that the City of New York's operating personnel are adequately trained.
 - 5. Verify a contract is in place for a post occupancy review with O&M staff within 10 months after Substantial Completion.

- C. The Commissioning process shall be a team effort and encompass, as well as coordinate, the traditionally separate functions of system documentation, system installation, equipment startup, control system calibration, testing, balancing and verification and performance checkouts.
- D. The CxA will work closely with the construction team, cooperating on and coordinating all Cx activities with the CM, City of New York's representative, Trade Contractors, subcontractors, manufacturers and equipment suppliers.

The Cx process shall not reduce the responsibility of the CM to comply with the Contract Documents.

1.4 DEFINITIONS

- A. Refer to Division 01 Section "General Commissioning Requirements" for definitions.

1.5 SUBMITTALS

- A. Refer to Division 01 Section "General Commissioning Requirements" for CxA's role.
- B. Refer to Division 01 Section "General Conditions" for specific requirements.
- C. In addition, provide the following:
 - 1. Certificates of readiness
 - 2. Certificates of completion of installation, pre-start, and startup activities.
 - 3. O&M manuals
 - 4. Test reports
- D. Control Drawings Submittal
 - 1. The control drawings shall have a key to all abbreviations.
 - 2. The control drawings shall contain graphic schematic depictions of the systems and each component.
 - 3. The schematics will include the system and component layout of any equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
 - 4. Provide a full points list with at least the following included for each point:
 - a. Controlled system
 - b. Point abbreviation
 - c. Point description
 - d. Display unit
 - e. Control point or set point (Yes / No)
 - f. Monitoring point (Yes / No)
 - g. Intermediate point (Yes / No)
 - h. Calculated point (Yes / No)

1.6 QUALITY ASSURANCE

- A. Test Equipment Calibration Requirements: Contractors will comply with test manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately after

instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxA upon request.

1.7 COORDINATION

- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to coordination during the commissioning process.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

- A. All standard testing equipment required to perform startup, initial checkout and functional performance testing shall be provided by the Contractor for the equipment being tested. For example, the mechanical contractor of Division 23 shall ultimately be responsible for all standard testing equipment for the HVAC&R system and controls system in Division 23, except for equipment specific to and used by TAB in their commissioning responsibilities. A sufficient quantity of two-way radios shall be provided by each subcontractor.
- B. Special equipment, tools and instruments (specific to a piece of equipment and only available from vendor) required for testing shall be included in the base bid price to the City of New York and left on site, except for stand-alone data logging equipment that may be used by the CxA.
- C. Proprietary test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist in the commissioning process as needed. Proprietary test equipment (and software) shall become the property of the City of New York upon completion of the commissioning process.
- D. Data logging equipment and software required to test equipment will be provided by the CxA, but shall not become the property of the City of New York.
- E. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year.

PART 3 - EXECUTION

3.1 GENERAL DOCUMENTATION REQUIREMENTS

- A. With assistance from the installing contractors, the CxA will prepare Pre-Functional Checklists for all commissioned components, equipment, and systems
- B. Red-lined Drawings:
 - 1. The contractor will verify all equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawings.

2. Preliminary red-lined drawings must be made available to the Commissioning Team for use prior to the start of Functional Performance Testing.
 3. Changes, as a result of Functional Testing, must be incorporated into the final as-built drawings, which will be created from the red-lined drawings.
 4. The contracted party, as defined in the Contract Documents will create the as-built drawings.
- C. Operation and Maintenance Data:
1. Contractor will provide a copy of O&M literature within 45 days of each submittal acceptance for use during the commissioning process for all commissioned equipment and systems.
 2. The CxA will review the O&M literature once for conformance to project requirements.
 3. The CxA will receive a copy of the final approved O&M literature once corrections have been made by the Contractor.
- D. Demonstration and Training:
1. Contractor will provide demonstration and training as required by the specifications.
 2. A complete training plan and schedule must be submitted by the contractor to the CxA four weeks (4) prior to any training.
 3. A training agenda for each training session must be submitted to the CxA one (1) week prior the training session.
 4. The CxA shall be notified at least 72 hours in advance of scheduled tests so that testing may be observed by the CxA and Commissioner. A copy of the test record shall be provided to the CxA, City of New York, and the Commissioner.
 5. Engage a Factory-authorized service representative to train the City of New York's maintenance personnel to adjust, operate, and maintain specific equipment.
 6. Train The City of New York's maintenance personnel on procedures and schedules for starting and stopping, trouble shooting, servicing, and maintaining equipment.
 7. Review data in O&M Manuals.

3.2 CONTRACTOR'S RESPONSIBILITIES

- A. Mechanical, Controls and TAB Contractors. The commissioning responsibilities applicable to each of the mechanical, controls and TAB contractors of Division 23 are as follows (all references apply to commissioned equipment only):
- B. Perform commissioning tests at the direction of the CxA.
- C. Attend construction phase controls coordination meetings.
- D. Attend testing, adjusting, and balancing review and coordination meetings.
- E. Participate in HVAC&R systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.
- F. Provide information requested by the CxA for final commissioning documentation.
- G. Include requirements for submittal data, operation and maintenance data, and training in each purchase order or sub-contract written.
- H. Prepare preliminary schedule for Mechanical system orientations and inspections, operation and maintenance manual submissions, training sessions, pipe and duct system testing,

flushing and cleaning, equipment start-up, testing and balancing and task completion for the Commissioner. Distribute preliminary schedule to commissioning team members.

- I. Update schedule as required throughout the construction period.
- J. During the startup and initial checkout process, execute the related portions of the prefunctional checklists for all commissioned equipment.
- K. Assist the CxA in all verification and functional performance tests.
- L. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.
- M. Gather operation and maintenance literature on all equipment, and assemble in binders as required by the specifications. Submit to CxA (45) days after submittal acceptance.
- N. Coordinate with the CxA to provide (72) hour advance notice so that the witnessing of equipment and system start-up and testing can begin.
- O. Notify the CxA a minimum of (2) weeks in advance of the time for start of the testing and balancing work. Attend the initial testing and balancing meeting for review of the official testing and balancing procedures.
- P. Participate in, and schedule vendors and contractors to participate in the training sessions.
- Q. Provide written notification to the CM/GC and CxA Authority that the following work has been completed in accordance with the contract documents, and that the equipment, systems, and sub-system are operating as required.
 1. HVAC&R equipment including all fans, air handling units, piping, ductwork, dampers, terminals, and all other equipment furnished under this Division.
 2. Controls system used for equipment monitoring and manipulation
 3. Fire stopping in the fire rated construction, including fire and smoke damper installation, caulking, gasketing and sealing of smoke barriers.
 4. Fire detection and smoke detection devices furnished under other divisions of the specification.
- R. The equipment supplier shall document the performance of his equipment.
- S. Provide a complete set of red-lined drawings to the CxA prior to the start of Functional Performance Testing.
- T. Test, Adjust and Balance Contractor
 1. Attend initial commissioning coordination meeting scheduled by the Commissioning Authority.
 2. Submit the site specific testing and balancing plan to the CxA and AE for review and acceptance.
 3. Attend the testing and balancing review meeting scheduled by the CxA. Be prepared to discuss the procedures that shall be followed in testing, adjusting, and balancing the HVAC&R system.
4. At the completion of the testing and balancing work, and the submittal of the final testing and balancing report, notify the HVAC&R contractor and the CM/GC.
5. At the completion of testing and balancing work, and the submittal of the final testing and balancing report, notify the HVAC&R Contractor and the CM/GC.

- 6. Participate in verification of the testing and balancing report, which will consist of repeating measurements contained in the testing and balancing reports. Assist in diagnostic purposes when directed.
 - U. Provide training of The City of New York's operating staff using expert qualified personnel, as specified.
 - V. Equipment Suppliers
 - 1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the City of New York, to keep warranties in force.
 - 2. Assist in equipment testing per agreements with contractors.
 - 3. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.
 - W. Refer to Division 01 Section "General Commissioning Requirements" for additional contractor responsibilities.
- 3.3 OWNER'S RESPONSIBILITIES
- A. Refer to Division 01 Section "General Commissioning Requirements" for City of New York's Responsibilities.
- 3.4 CxA RESPONSIBILITIES
- A. Refer to Division 01 Section "General Commissioning Requirements" for CxA's Responsibilities.
- 3.5 TESTING PREPARATION
- A. Certify in writing to the CxA that HVAC&R systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.
 - B. Certify in writing to the CxA that HVAC&R instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.
 - C. Certify in writing that testing, adjusting, and balancing procedures have been completed and that testing, adjusting, and balancing reports have been submitted, discrepancies corrected, and corrective work approved.
 - D. Place systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).
 - E. Inspect and verify the position of each device and interlock identified on checklists.
 - F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.
 - G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.
- 3.6 TESTING, ADJUSTING AND BALANCING VERIFICATION
- A. Air and water testing, balancing and equipment performance verification shall be accomplished by an independent test and balance firm. The CxA shall spot check this work to verify accuracy of results
 - B. Prior to performance of Testing, Adjusting and Balancing work, provide copies of reports, sample forms, checklists, and certificates to the CxA.

- C. Notify the CxA at least ten (10) days in advance of testing and balancing Work, and provide access for the CxA to witness testing and balancing Work.
- D. Provide technicians, instrumentation, and tools to verify testing and balancing of HVAC&R systems at the direction of the CxA.
 - 1. The CxA will notify testing and balancing subcontractor ten (10) days in advance of the date of field verification. Notice will not include data points to be verified.
 - 2. The testing and balancing subcontractor shall use the same instruments (by model and serial number) that were used when original data were collected.
 - 3. Remedy the deficiency and notify the CxA so verification of failed portions can be performed.

3.7 GENERAL TESTING REQUIREMENTS

- A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.
- B. Scope of HVAC&R testing shall include entire HVAC&R installation, from central equipment for heat generation and refrigeration through distribution systems to each conditioned space. Testing shall include measuring capacities and effectiveness of operational and control functions.
- C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.
- D. The CxA along with the HVAC&R contractor, testing and balancing Subcontractor, and HVAC&R Instrumentation and Control Subcontractor shall prepare detailed testing plans, procedures, and checklists for HVAC&R systems, subsystems, and equipment.
- E. Tests will be performed using design conditions whenever possible.
- F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.
- G. The CxA may direct that set points be altered when simulating conditions is not practical.
- H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.
- I. If tests cannot be completed because of a deficiency outside the scope of the HVAC&R system, document the deficiency and report it to the City of New York. After deficiencies are resolved, reschedule tests.
- J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.8 HVAC&R SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

- A. Equipment Testing and Acceptance Procedures: Testing requirements are specified in individual Division 23 sections. Provide submittals, test data, inspector record, and certifications to the CxA.
- B. HVAC&R Instrumentation and Control System Testing: Field testing plans and testing requirements are specified in Division 23 Sections "Instrumentation and Control for HVAC"

and "Sequence of Operations for HVAC Controls." Assist the CxA with preparation of testing plans.

- C. Pipe system cleaning, flushing, hydrostatic tests, and chemical treatment: Test requirements are specified in Division 23 piping Sections. HVAC&R Contractor shall prepare a pipe system cleaning, flushing, and hydrostatic testing plan. Provide cleaning, flushing, testing, and treating plan and final reports to the CxA. Plan shall include but not limited to the following:
 - 1. Sequence of testing and testing procedures for each section of pipe to be tested, identified by pipe zone or sector identification marker. Markers shall be keyed to Drawings for each pipe sector, showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of piping to be physically located and identified when referred to in pipe system cleaning, flushing, hydrostatic testing, and chemical treatment plan.
 - 2. Description of equipment for flushing operations.
 - 3. Minimum flushing water velocity.
 - 4. Tracking checklist for managing and ensuring that all pipe sections have been cleaned, flushed, hydrostatically tested, and chemically treated.
- D. Refrigeration System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of chillers, cooling towers, refrigerant compressors and condensers, heat pumps, and other refrigeration systems. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested.
- E. HVAC&R Distribution System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of air, steam, and hydronic distribution systems; special exhaust; and other distribution systems, including HVAC&R terminal equipment and unitary equipment.
- F. Vibration and Sound Tests: Provide technicians, instrumentation, tools, and equipment to test performance of vibration isolation and seismic controls.
- G. The work included in the commissioning process involves a complete and thorough evaluation of the operation and performance of all components, systems and sub-systems. The following equipment and systems shall be evaluated:
 - 1. HVAC systems
 - 2. Building Automation System
 - 3. Ductwork and accessories
 - 4. Heating Hot Water System
 - 5. Testing, Adjusting and Balancing

3.9 APPROVAL

- A. Refer to other specification and "General Commissioning Requirements" for approval procedures.

3.10 DEFERRED TESTING

- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to deferred testing.

3.11 OPERATION AND MAINTENANCE MANUALS

- A. The Operation and Maintenance Manuals shall conform to Contract Documents requirements as stated in Division 01.

- B. Refer to Division 01 Section "General Commissioning Requirements" for the CxA roles in the Operation and Maintenance Manual contribution, review and approval process.
- C. An updated as-built version of the control drawings and sequences of operation shall be included in the final controls O&M manual submittal.

3.12 TRAINING OF CITY OF NEW YORK PERSONNEL

- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to training.
- B. Mechanical Contractor. The mechanical contractor shall have the following training responsibilities:
 - 1. Provide the CxA with a training plan two weeks before the planned training.
 - 2. Provide designated City of New York's personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of HVAC equipment including, but not limited to, all HVAC equipment (ex. pumps, heat exchangers, chillers, heat rejection equipment, air conditioning units, air handling units, fans, terminal units, controls and water treatment systems, etc.)
 - 3. Training shall normally start with classroom sessions followed by hands-on training on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.
 - 4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
 - 5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment is required. More than one party may be required to execute the training.
 - 6. The controls contractor shall attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.
 - 7. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
 - 8. Training shall include:
 - a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
 - b. Discussion of relevant health and safety issues and concerns.
 - c. Discussion of warranties and guarantees.
 - d. Common troubleshooting problems and solutions.
 - e. Explanatory information included in the O&M manuals and the location of all plans and manuals in the facility.
 - f. Discussion of any peculiarities of equipment installation or operation.
 - g. The format and training agenda in The HVAC Commissioning Process, ASHRAE Guideline 1-2007, is recommended.

9. Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and preventative maintenance for all pieces of equipment.
 10. The mechanical contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system.
 11. Training shall occur after functional testing is complete, unless approved otherwise by the City of New York.
- C. Controls Contractor. The controls contractor shall have the following training responsibilities:
1. Provide the CxA and AE with a training plan four weeks before the planned training.
 2. The controls contractor shall provide designated City of New York personnel training on the control system in this facility. The intent is to clearly and completely instruct the City of New York on all the capabilities of the control system.
 3. Training manuals. The standard operating manual for the system and any special training manuals will be provided for each trainee, with three extra copies left for the O&M manuals. In addition, copies of the system technical manual will be demonstrated during training and three copies submitted with the O&M manuals. Manuals shall include detailed description of the subject matter for each session. The manuals will cover all control sequences and have a definitions section that fully describes all relevant words used in the manuals and in all software displays. Manuals will be approved by the CxA and A/E. Copies of audiovisuals shall be delivered to the City of New York.
 4. The trainings will be tailored to the needs and skill-level of the trainees.
 5. The trainers will be knowledgeable on the system and its use in buildings. For the on-site sessions, the most qualified trainer(s) will be used. The City of New York shall approve the instructor prior to scheduling the training.
 6. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
 7. The controls contractor shall attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.
 8. Three (3) training sessions are suggested:
 - a. Training I. Control System. The first training shall consist of 8 hours of actual training. This training may be held on-site or in the supplier's facility. If held off-site, the training may occur prior to final completion of the system installation. Upon completion, each student, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.
 - b. Training II. Building Systems. The second session shall be held on-site for a period of 8 hours of actual hands-on training after the completion of system commissioning. The session shall include instruction on:
 - 1) Specific hardware configuration of installed systems in this building and specific instruction for operating the installed system, including HVAC systems, lighting controls and any interface with security and communication systems.

- 2) Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing set points and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.
 - 3) All trending and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends. Trainees will actually set-up trends in the presence of the trainer.
 - 4) Every screen shall be completely discussed, allowing time for questions.
 - 5) Use of keypad or plug-in laptop computer at the zone level.
 - 6) Use of remote access to the system via phone lines or networks.
 - 7) Setting up and changing an air terminal unit controller.
 - 8) Graphics generation
 - 9) Point database entry and modifications
 - 10) Understanding DDC field panel operating programming (when applicable)
- c. Training III. The third training will be conducted on-site six months after occupancy and consist of 8 hours of training. The session will be structured to address specific topics that trainees need to discuss and to answer questions concerning operation of the system.
- D. TAB. The TAB contractor shall have the following training responsibilities:
1. TAB shall meet with facility staff after completion of TAB and instruct them on the following:
 - a. Go over the final TAB report, explaining the layout and meanings of each data type.
 - b. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.
 - c. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.
 - d. Discuss any temporary settings and steps to finalize them for any areas that are not finished.
 - e. Other salient information that may be useful for facility operations, relative to TAB.

END OF SECTION 23 08 00

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SECTION 23 09 00 – INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Provide commissioning as per third party commissioning agent requirements. Refer to commissioning specification for requirements.

1.2 SUMMARY

- A. This Section includes control equipment for HVAC systems and components.
- B. Related Sections include the following:

1.3 DEFINITIONS

- A. DDC: Direct-Digital Controls.
- B. BCS: Building Control System
- C. AFS: Air Flow Sensor
- D. SPS: Static Pressure Sensor
- E. DPS: Differential Pressure Sensor
- F. EM: Energy Meter
- G. FAS: Fire Alarm System
- H. BLN: Building Level Network.
- I. FLN: Field Level Network.
- J. PID: Proportional Integral and Derivative
- K. VFD: Variable Frequency Drive
- L. M+V: Measurement and Verification

1.4 SYSTEM DESCRIPTION

- A. Control system consists of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, and accessories to control mechanical systems networked to the new building control system.
- B. Control system consists of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, accessories, and software connected to distributed controllers

operating in multiuser, multitasking environment on network and programmed to control mechanical systems.

- C. Building Control System (BCS) shall include the following:
1. Fan Coil Unit Control and Monitoring
 2. Fan Coil Unit Leak Detection Monitoring
 3. Finned Tube Radiation Control
 4. Miscellaneous Exhaust Systems.
 5. VFD Integration.
 6. Interface with electrical meters for M+V requirements (KWH electrical usage for power panels and lighting control panels-coordinate with Division 26 for quantity and location.
 7. Interface with domestic water meter.
 8. Interface wiring, conduit, relays between fire alarm system devices (shutdown) and VFD's.
 9. Cabinet Unit Heater
 10. Floor zone airflow sensors (refer to mechanical riser drawings for AFS quantity and location)
 11. Floor zone BTU meters for chilled and hot water systems (refer to mechanical riser diagrams for EM quantity and locations).
 12. Differential pressure sensor for hot and chilled water systems (ground level refer to mechanical riser diagram for location)
 13. Heat Trace Monitoring
 14. LEED Measurement and Verification (M+V)
 15. Provide new Controls System workstation-server in Room M13.
 16. Data and web server.
 17. Remote Notification System
- D. Revision to existing control system shall include:
1. As shown on M-901.
- E. The control system shall consist of the following:
1. Stand-alone DDC Controllers for all main equipment (fan coil units, etc.). The intent of this specification is that the loss of any one DDC controller shall not affect the operation of other HVAC systems. It shall only affect the points connected to the failed DDC controller. It is not acceptable that any control loops are split across two or more DDC control panels.
 2. Stand-alone networked Terminal Equipment Controllers (TEC) shall only be used for terminal equipment.
- F. The system shall be modular in nature and permit expansion of both capacity and functionality through the addition of sensors, actuators, DDC Controllers, and operator devices. Each DDC Controller shall be modular in nature and shall permit the addition of point hardware modules. Remaining points on an underutilized module may be used in the space points calculation.
- G. Controllers shall assign password access and control priorities to either fully assignable point groups or each point individually. The logon password (at new PC workstation or portable operator terminal) shall enable the operator to monitor, adjust and/or control only the points that the operator is authorized for. All other points shall not be displayed at the new PC workstation or portable terminal. (i.e. all base points shall be accessible to any base building operators, but only electrical points shall be accessible to house electricians). Passwords and priority levels for every point shall be fully programmable and adjustable.

- H. The DDC System shall be programmed to automatically detect critical alarms, which require paging, create an action statement for each page, and select the person to receive the page.
- I. Front end workstation shall consist of a color monitor and personal computer with sufficient memory capacity based on currently available equipment. A color printer shall be provided for report and graphic printout.
- J. Remote Notification System: The front end workstation shall be configured to send out messages to numeric pagers, message service, text messaging, cell phones, mobile devices, and e-mails based on a critical alarm condition.

1.5 SYSTEM PERFORMANCE

- A. Comply with the following response times and performance requirements:
 - 1. Graphic Display: Display graphic with minimum 20 dynamic points with current dynamic data within 20 seconds.
 - 2. Graphic Refresh: Update graphic with minimum 20 dynamic points with current dynamic data within 8 seconds.
 - 3. Object Command: Reaction time of less than two seconds between operator command of a binary object and device reaction.
 - 4. Object Scan: Transmit change of state and change of analog values to control units or workstation within six seconds.
 - 5. Alarm Response Time: Annunciate alarm at workstation within 45 seconds. Multiple workstations must receive alarms within 5 seconds of each other.
 - 6. Program Execution Frequency: Run capability of applications as often as 5 seconds, but selected consistent with mechanical process under control.
 - 7. Performance: Programmable controllers shall execute DDC PID control loops, and scan and update process values and outputs at least once per second.
 - 8. Reporting Accuracy and Stability of Control:
 - a. Space Temperature: +/- 0.5degF
 - b. Ducted Air Temperature: +/- 0.5 degF
 - c. Outside Air Temperature: +/- 1 degF
 - d. Dew Point Temperature: +/- 1.5 degF
 - e. Temperature Differential: +/- 0.15 degF
 - f. Relative Humidity: +/- 2%RH
 - g. Airflow (Pressurized Spaces): +/- 3% of full scale
 - h. Airflow (Measuring Stations): +/- 5% of full scale
 - i. Airflow (Terminal): +/- 10% of full scale

1.6 SHOP DRAWING SUBMITTALS

- A. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.
 - 1. Each control device labeled with setting or adjustable range of control.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Schematic flow diagrams showing fan coil units, coils, dampers, valves, and control devices, etc.
 2. Written description of sequence of operation for all HVAC, FAS AHU shutdown. Coordinate with other trades as required.
 3. Schedule of dampers including size, leakage, and flow characteristics.
 4. Schedule of valves including line size, body type, actuator type, ANSI rating, leakage, sizing and flow characteristics.
 5. System architecture and trunk cable schematic showing programmable control unit locations and trunk data conductors.
 6. Listing of connected data points, including connected control unit and input device.
 7. System colorgraphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations.
 8. System configuration showing peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
 9. DDC System Hardware: Bill of materials of equipment indicating quantity, manufacturer, model number. Include technical data for operating system software, interface equipment, control units, transducer/ transmitter, sensors, actuators, relays, switches, dampers, valves, etc.
 10. Control System Software: Include technical data for operating system software, colorgraphics, and any third party applications.
 11. Controlled Systems: Instrumentation list with element name, type of device, manufacturer, model number, and product data.
 12. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 13. Bill of materials of equipment indicating quantity, manufacturer, and model number.
 14. Wiring Diagrams: Power, signal and control wiring. Differentiate between manufacturer installed and field installed wiring.
 15. Details of control panel faces, including controls, instrumentation and labeling.
 16. Submit complete color "snapshots" of control system graphic page showing all mechanical, electrical and plumbing systems including KWH calculations to meet LEED M+V requirements.
- C. Samples: For each color required, of each type of thermostat cover. Coordinate space temperature, humidity and CO2 cover appearance with Architect.
- D. DDC System Hardware:
1. Wiring diagrams for control units with termination numbers.
 2. Schematic diagrams and floor plans for field sensors and control hardware.
 3. Schematic diagrams for control, communication and power wiring showing trunk data conductors and wiring between operator workstation and control unit locations.
- E. Software and Firmware Operational Documentation: Include the following:
1. Software operating and upgrade manuals.
 2. Program Software Backup: On a magnetic media or compact disc, complete with data files.
 3. Device address list.
 4. Printout of software application and graphic screens.
- F. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

- G. Maintenance Data: For systems to include in maintenance manuals specified in DDC General Conditions. Include the following:
1. Maintenance instructions and lists of spare parts for each type of control device.
 2. Interconnection wiring diagrams with identified and numbered system components and devices.
 3. Keyboard illustrations and step-by-step procedures indexed for each operator function.
 4. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
 5. Calibration records and list of set points.
- H. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- I. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors. Revise Shop Drawings to reflect actual installation and operating sequences.
- J. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors. Revise shop drawings to reflect actual point to point wiring installation and operating sequences.

1.7 QUALITY ASSURANCE

- A. A minimum of three (3) years of demonstrated technical expertise and experience in the manufacturing installation and maintenance of DDC Systems similar in size and complexity to this project.
- B. Single source responsibility of manufacturer shall be the complete installation and proper operation of DDC System and shall include debugging and proper calibration of each component in the entire system.
- C. Comply with ASHRAE 135 (BACnet protocol) for DDC system components.
- D. All work shall conform to the following Codes and Standards, where applicable:
1. National Fire Protection Association (NFPA) Standards, as specified.
 2. National Electrical Code (NEC) and applicable local Electrical Code.
 3. Underwriters' Laboratories (UL) listing and labels, as specified.
 4. Factory Mutual (FM).
 5. American National Standards Institute (ANSI).
 6. National Electric Manufacturers' Association (NEMA).
 7. American Society of Mechanical Engineers (ASME).
 8. American Society of Heating, Refrigerating and Air Conditioning (ASHRAE).
 9. Air Movement and Control Association (AMCA).
 10. Institute of Electrical and Electronic Engineers (IEEE).
 11. American Standard Code for Information Interchange (ASCII).
 12. Manufacturer's Standardization Society of the Valve and Fitting Industry (MSS).
 13. Electronics Industries Association (EIA).
 14. Occupational Safety and Health Administration (OSHA).
 15. American Society for Testing and Materials (ASTM).
 16. NFPA 92A and 92B
 17. Electrical Code City of New York
 18. Building Code City of New York
 19. UL 864 UUKL of controls required for smoke purge interface.

- E. Electrical Components, Devices and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction and marked for intended use.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to unit manufacturer.

1.9 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.10 WARRANTY

- A. The system, including all hardware, software and workmanship, shall be guaranteed for a period of one (1) year from the date of final acceptance. Any manufacturing or installation defects arising during this warranty period shall be corrected at no cost to the Commissioner. Warranty shall include one complete heating and cooling season.
- B. All applicable software, as detailed in this specification, shall be updated by the BCS contractor free of charge during the warranty period to insure that the system software is the most up-to-date software available, for the system hardware installed, at the end of the warranty.
- C. All corrective software modifications made during the warranty service period shall be updated on all user documentation and on user and manufacturer archived software disks.

1.11 TRAINING

- A. Provide 5 days of training on site.
- B. The BCS Contractor shall provide instructors to give full instructions to designated personnel in the adjustment, operation and maintenance of the system installed. Instructors shall be thoroughly familiar with all the aspects of the subject matter they are to teach. All training shall be held during the normal work hours of 8:00am to 4:30pm weekdays.
- C. Training shall include but not limited to:
 - 1. Explanation of drawings and operations and maintenance manuals.
 - 2. Walk thru of the job to locate control components.
 - 3. DDC Controller and TEC operation.
 - 4. Explanation of adjustment, calibration and replacement procedures.
- D. Training of the Commissioner's operation and maintenance personnel is required in cooperation with the Commissioner. Provide competent, factory, authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems. The instruction shall be scheduled in coordination with the Construction Manager after submission and approval of formal training plans.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:

1. Siemens Technology
2. Johnson Controls
3. Automated Logic Corporation
4. Honeywell
5. Trane
6. Distech Controls

B. Existing control system manufacturer:

1. Distech Controls-no exception taken

2.2 ENVIRONMENT

- A. All equipment detailed in this specification or other equipment associated with the DDC shall be capable of operation in environmental conditions where equipment is located and must meet Commissioner's environmental guidelines. Note that the control system will be operating in a semi-automatic mode during construction activities.

2.3 SYSTEM ARCHITECTURE

A. Building Level Network (BLN)

1. All DDC Controllers shall directly reside on the BLN such that peer communications may be executed directly between DDC Controllers.

2.4 DDC CONTROLLER

- A. Controllers with 32-bit processors shall be complete with power supplies, a real time clock, input and output modules, memory, processors and all other items necessary for proper and correct interfacing and operation of the control functions described in this Specification. The system also shall be able to automatically synchronize all system clocks daily from any operator-designated device in the system. The system shall automatically adjust for daylight saving and standard time.
- B. All controllers shall have peer-to-peer communications. All controllers shall have a standalone capability such that a failure of the operator's station shall still permit the plant and controls associated with the controllers, to continue to operate normally with the controllers continuing to communicate with one another.
- C. In the event of transmission failure in the controller network, the controllers shall continue to operate with all sequence interlocks and control strategies operating normally excepting those, which require global information. Either user adjustable default values or the last sensed value (user selectable) shall then be assumed for these global parameters.
- D. Controllers shall be able to provide the operator's station with status information concerning their internal operations. This information shall include, but not be limited to:
1. Data transmission and verification

2. Input/Output point status (i.e. sensor fault, point forced, etc.)
 3. Program status (i.e. program error, program running, etc.)
 4. Internal battery condition
- E. All necessary interfacing equipment shall be provided so that the controllers are fully compatible with all items of plant and equipment.
- F. The controller shall be capable of accepting binary, analog, pulsed inputs and providing binary and analog outputs.
1. Binary Input – Shall monitor the change of state of a dry contact.
 2. Pulsed Input – Pulses (dry contact closures i.e. binary type input) originating typically from flow meters, electrical kWh or kVA meters, etc. and shall be accumulated into registers. A register shall be resettable to zero either by software or operator command. The input must be able to accept pulses up to a frequency of 10Hz with a minimum duration of 50ms. All accounts must be stored in a non-volatile register so the count value is not affected by a power failure.
 3. Binary Output – The output signal, a dry contact which shall close upon activation of the output. Should binary outputs be used to drive modulating actuators, other than for terminal unit applications, a potentiometer shall be fitted to the actuator and connected to the DDC to provide actuator position feedback. The controller shall use this feedback to ensure the accuracy of positioning of the actuator.
 4. Analog Inputs – Analog to digital conversion (ADC) with a minimum resolution of 1024 counts (16 Bit) over the input range (i.e. 0-10V, 2-10V, 0-20mA, 4-20mA etc.) of the sensor. The sensor range shall match the process control range. Any equipment necessary for the conversion of an input signal to the required input level shall be provided.
 5. Analog Outputs – Digital to analog conversion (DAC) shall be performed by the controllers with a minimum resolution of 256 counts (16 Bit) over the output range which shall also match the control range of the device and/or system being controlled. Any equipment necessary for the conversion of the output signal to the required process level (i.e. 0-10V, 2-10V, 0-20mA, 4-20mA etc.) shall be provided.
 6. Where analog outputs are specified driving damper and valve actuators, they shall not be used to drive raise/lower actuators through interface devices.
 7. Universal Inputs – Shall be configurable to either binary or analogue input and shall have the features defined above.
- G. Each controller or controller location shall be provided with spare hardware capacity for future additions of at least 15 percent of each type of point. Universal inputs may be counted as either a spare digital or analog point, but not both. Note that this spare capacity may be accomplished by the addition of input/output modules. Memory shall also be sufficient to allow all programs associated with these points to be run in the controller. The Contractor shall state in his offer how many spare points are actually available on each controller or at each controller location and then expansion capability.
- H. The controllers shall be provided with their own internal battery backup power supply, capable of maintaining all memory including the real time clock for not less than 72 hours. The battery shall be easily replaceable i.e. not soldered to the PCB.
- I. Each analog input shall be calibrated (to compensate for non-linear characteristics of input devices, line resistance and similar items) to achieve accuracy, of the displayed value on the operator's station, as detailed in this Specification for each sensing device. Calibration and scaling data shall be retained in the controller memory. Open or closed circuits on sensor inputs shall be recognized by the controller and annunciated as alarms on the system operator station(s).

- J. It shall be possible to characteristics each analog output to an actuator in order to obtain a near-linear response from the device the actuator is controlling. This may take the form of a look up table with a minimum of 6 coordinates, such that the linear output from a control loop is converted into a non-linear control signal to the actuator.
- K. The controllers shall be mounted in control panels, which shall meet project environmental guidelines.

2.5 ALARM PROCESSING

- A. Alarms shall be classified by their alarm type. The facility shall be provided for enabling and disabling each individual alarm on the system.
- B. Once generated, the alarm shall be processed by its associated alarm type as defined in the I/O Point Schedules. The alarm types shall be as follows:
 - 1. General Mismatch
 - 2. Critical Mismatch
 - 3. General Binary
 - 4. Critical Binary
 - 5. General Analog
 - 6. Critical Analog

2.6 ALARM INHIBITION

- A. Consequential alarm suppression algorithms shall be provided to limit the alarms annunciated on the DDC System to those associated with the source of the initial alarm condition e.g. fire alarms shall not initiate mismatch alarms; restoration of power following a power failure shall not initiate mismatch alarms etc.

2.7 CONFIGURATION

- A. Configuration data shall be stored in the DDC Controllers or the Terminal Unit Controllers. Configuration data shall include but not be limited to the following:
 - 1. The unit applicable (deg F, GPM's, inches, etc.)
 - 2. The point identifier (minimum of 12 characters).
 - 3. The point alarm message if applicable (minimum of 80 characters).
 - 4. The point descriptor (minimum of 32 characters).

2.8 DDC STANDARD PROGRAMS

- A. The device schedules included in this Specification provide details of inputs monitored and outputs controlled by the DDC System. All point types are described under Controllers elsewhere in this Specification. The DDC System shall allow for the following point functionality and standard programs to be available:
 - 1. Point Override
 - 2. Manual Start/Stop
 - 3. Fixed Time Program
 - 4. Optimum Start/Stop
 - 5. Control Loops
 - 6. Rotational Point
 - 7. Run Time Totalization

8. Anti-Short Cycling
9. Staggered Start
10. User Definable Software
11. General Control Requirements

2.9 INTEGRATION

- A. The control system shall be seamlessly integrated with the Variable Frequency Drives.
- B. The control system shall utilize and be compatible with standard integration protocols (BACnet, Modbus, etc.) for subsystem integration. Coordinate integration protocols with subsystem manufacturer.

2.10 WORKSTATION COLORGRAPHICS

- A. The new workstation graphic user interface (GUI) shall include the new HVAC systems and floorplans associated with this specification. Provide animated colorgraphic floorplans and system schematics for each piece of mechanical equipment to facilitate and optimize system performance analysis and speed alarm recognition. The operator interface shall allow user access to various system schematics and floor plans via a graphical penetration scheme, menu selection or text based commands. Dynamic temperature, humidity, pressure and status indication shall be shown in their actual respective locations on schematics and floor plans to represent current conditions without operator intervention. The windowing environment of the workstation shall allow the user to simultaneously view several graphics at a time to analyze total building operation or to allow the display of a graphic associated with an alarm to be viewed without interrupting work in progress. Graphic generation software shall be provided to allow the user to add, modify, or delete graphic displays via an off the shelf graphics package.
- B. Operator specific password access protection shall allow the user to limit workstation control, display, and data base manipulation capabilities for each object in the system. An object shall be defined as any input or output point, setpoint, system program, etc. Operators shall only be able to perform only those commands on the objects available based on their respective passwords. Menu selection displayed shall be limited to only those items defined for the access level of the password used to log-on.
- C. Software shall allow the operator to perform commands including, but not limited to start-up or shutdown of equipment, adjust setpoints, time programming, enable/disable process execution, lock/unlock alarm reporting, enable/disable totalization, enable/disable trending, override PID setpoints, enter temporary override schedules, define holiday schedule, change time/date, enter/modify analog warning and alarm limits, view limits.
- D. Provide historical trending capability to allow the operator to easily monitor and preserve records of system activity over an extended period of time. All control system points and shall have capability to be trended automatically (at the same time) at time based intervals. Trend data shall have capability to be stored on server for a period of 2 years to meet the LEED measurement and verification requirements. M+V data shall be retrievable for any day, month or year.

2.11 FIELD DEVICES

- A. Input/Output sensors and devices shall be closely matched to the requirements of the DDC for accurate, responsive, noise-free signal input/output. Control input response shall be high sensitivity and matched to the loop gain requirements for precise and responsive control.

B. Temperature Sensors

1. Provide the following instrumentation as required by the monitoring, control and optimization functions.
2. Temperature Transmitter (TT)

C. Temperature Transmitter Assembly – airstream averaging type

1. The assembly shall consist of a capillary type 100 or 1000-ohm platinum RTD housed in a flexible sheath contained in housing suitable for duct mounting.
2. Accuracy: +/- 0.25degF.

D. Temperature Transmitter Assembly – air stream non-averaging type.

1. The assembly shall consist of an insertion type 100 or 1000 ohm platinum RTD mounted on a 12 inch probe (or ½ duct diameter) contained in a housing suitable for duct mounting.
2. Accuracy: +/- 0.25degF.
3. For outside air applications mount with weather protection and sun shield.

E. Temperature Transmitter Assembly – space

1. The assembly shall consist of a 100 or 1000 ohm platinum RTD contained in a decorative ventilated enclosure similar in appearance to room thermostats.
2. Accuracy: +/- 0.25degF.
3. Manufacturer: Veris TWX series (temperature-only sensor)

F. Temperature Transmitter Assembly-Liquid Immersion

1. The assembly shall consist of a 100 or 1000ohm platinum RTD contained in a suitable enclosure and mounted in a stainless steel thermowell for pipe mounting application.
2. Accuracy: =/- .25degF.

G. Humidity Sensors

1. The assembly shall consist of a bulk polymer-sensing element mounted in housing suitable for application (outdoor, return, space).
2. For outdoor applications, sensor shall have an operating temperature of -10degF to 120degF.
3. For indoor applications, sensor shall have an operating temperature of 40degF to 100degF.
4. Accuracy ± 2% RH.
5. Control system shall convert temperature and humidity values to a dewpoint temperature value.
6. Manufacturer: Veris HWX series (wall-mounted combination temperature and humidity sensor)

H. Automatic Dampers

1. AMCA rated dampers shall have 13 gauge galvanized frames of not less than 76mm in width and blades of 16 gauge, or double 22 gauge, galvanized steel and shall be adequately braced to from a rigid assembly where required in galvanized ductwork. Dampers shall have blades not more 6 inches wide. Linkage and hardware shall be zinc-plated steel. Damper blades and rods shall be installed in horizontal position.

2. All dampers shall be of the proportioning or opposed blade type, and shall be electric motor operated. Dampers shall have continuous elastomer or stainless steel stops to avoid leakage. Bearings shall be oil tight non-ferrous sleeve type. All dampers shall be constructed to provide a maximum leakage of 3-1/2%, with an approach velocity of 1500 fpm when closed against a pressure of 4 inches of water. Submit leakage and flow characteristic data for all dampers.
 3. All outside air dampers shall automatically close in the event of a loss of power.
 4. Dampers shall be Ruskin.
- I. Automatic Control Valves
1. All automatic modulating control valves shall be fully proportioning globe or characterized ball valves. The control valves shall be installed in the vertical upright position. The valves shall be quiet in operation and fail-safe in either a normally open or closed position in the event of a power failure. The control valves shall be equipped with throttling plugs, stainless steel trim, and renewable composite disk and be capable of operating at varying rates of speed to correspond to the exact dictates of the controller. All control valves shall be sized by the controls contractor and shall be guaranteed to meet the heating and cooling loads scheduled. The controls contractor shall ensure that the valves selected will perform at all load conditions without cavitation. All control valves shall be suitable for the pressure conditions and shall close off against the differential pressure involved. Control valve operators shall be sized to close off against a differential pressure equal to the design pump head plus 150%. Pressure drop across the valve when fully open at design flow shall be between 3psi and 5psi.
- J. Valve and Damper Operators: Valve and damper operators shall be electronic. Operators shall be sufficiently sized to ensure smooth, positive, operation and tight shut-off against system pressure.
- K. Electric Thermostats: Furnish and install all line voltage thermostats. Thermostat contacts shall be rated for maximum heater amperage and shall be snap acting, SPDT. Thermostat cover shall provide exposed set point and key adjust.
- L. Carbon Dioxide Sensor
1. The carbon dioxide sensor shall provide an output signal correspondence linearly to 0-2000 ppm/0-5000 ppm (user adjustable) of CO₂ using Non-dispersive Infrared (NDIR) technology.
 2. The CO₂ concentration shall be determined by measuring the attenuation of a specific wavelength of infrared light travels from its source to a detector along a defined optical path. The sensor shall detect the amount of attenuation and convert it into a 0 to 10 VDC analog output signal, which corresponds linearly to 0 to 2000 ppm sensed concentration of CO₂.
 3. The sensor features shall have a membrane filter to help prevent contaminations from entering the sensing chamber and yet remain permeable to CO₂.
 4. A microprocessor-based offset compensation algorithm shall automatically compensate for drift. The compensation algorithm shall include a self-test that can detect problems (such as excessive drift) and initiate an alarm signal.
 5. In addition to compensating for drift, the microprocessor shall speed the full calibration process by automatically adjusting the span (of the 0 to 2000 ppm output range). One easy accessed button shall complete this process.
 6. Provide a separate 24 VAC transformer and power and control wiring.
 7. The sensor shall be suitable for space mounting as shown on the drawings.
 8. Sensor minimum requirements:
 9. Calibrate CO₂ sensors during the Commissioning Process.

10. Measurement Range 0-2000 ppm/0-5000 ppm (user adjustable) CO₂
11. Accuracy ± 80 ppm CO₂, up to 1500 ppm, ± 5 percent of reading above (@ room conditions).
12. Repeatability ± 10 ppm CO₂.
13. Maximum Drift ± 50 ppm CO₂ per year
14. Output Signal 0 to 10 VDC/4-20 mA proportional over the 0 to 2000 ppm/0-5000ppm CO₂ range.
15. Alarm Relay: SPST normally open dry rated for 10W maximum, 100 or 500 mA DC maximum with adjustable limit (0-2000 CO₂ factory set @ 1000ppm ± 50 ppm CO₂)
16. Alarm Set Resolution ± 20 ppm CO₂ minimum
17. Alarm Hysteresis 50 ppm CO₂.
18. Calibration Adjustments Automatic zero compensation and span calibrations; uses calibrated span and zero.
19. Calibration interval – greater than two (2) years.
20. Adjustment Resolution ± 20 ppm CO₂ minimum.
21. Response Time: <30 seconds to 63 percent of step change; <60 seconds to 100 percent of step change.
22. Warm up Time: <5 minutes
23. Ambient Operating Conditions 0degC to 50degC
24. 5 to 95 percent RH, non-condensing
25. Provide a calibration kit (flow system type) including zero gas and test carbon dioxide gas. Turn over complete kit to authority at warranty start date.
26. Provide a weatherproof enclosure for outside air application.
27. Manufacturer: Vaisala or approved equal.

M. Duct Airflow Measurement Device

1. Provide airflow measurement device for air measuring devices for floor duct take-offs as shown on mechanical drawings.
2. Each air flow-measuring device shall consist of one or more multi-point airflow measuring probes and single micro processor-based transmitter.
3. Each airflow point shall independently determine the airflow rate, which shall be equally weighted and averaged by the transmitter prior to output.
4. A single manufacturer shall provide both the airflow measuring probe(s) and transmitter.
5. Each independent sensor shall have an accuracy of $\pm 2\%$ of reading over the entire operating range.
6. Manufacturer: Ebtron Gold series or approved equal.

N. Current Sensors: Provide and install current sensing relays for all fan and pump motor status points in remote starter enclosures. Each sensor shall be split core, two wire, loop powered and sized for expected amperage and capable of detecting the monitored equipment operating at minimum speed. Units shall be UL listed.

O. Field Equipment Cabinets: All electric relays, transformers, power supplies, pressure transducers, override switches, etc., shall be mounted in a suitable NEMA enclosure and factory wired to terminal strips.

P. Component Tags: Valve Tags

1. All automatic and manual valves provided by this contractor, shall be identified with 50.8mm diameter brass tags and brass chains. Lettering shall be 12.7mm high, stamped and painted black. Automatic valve tags shall be stamped with the letters "AV" and sequentially numbered. Provide valve schedule and sample tags for approval.

Q. Sensor Tags

1. All sensors shall be identified with 25.4mm x 76.2mm black lamicoïd labels with engraved white lettering. Lettering shall be 6.35mm high. Provide sensor number, HVAC Unit number, part number and sensor range on tag. Submit tag schedule and sample for approval.
- R. Relays
1. All relays shall be plug in or rib style.
 2. Start/stop relay modules shall provide either momentary or maintained switching action as appropriate for the motor being started.
 3. Provide a required interposing relays and wiring for fractional horse power HVAC equipment that does not include a low-voltage motor starter with HOA.
 4. Provide required interposing relays for override from the FAS for all smoke shutdown sequence of operations.
- S. Leak Detection Sensors: Provide water leak detection sensors interfaced with the control system as required. Sensors: gold plated probes and microchip technology for dependable detection of conductive liquids. Power 11 to 27 volts (AC or DC) Sensors shall be powered for the DDC panel.
- T. Chilled and hot water energy usage meter
1. The liquid flow meter shall a non-invasive transit-time meter employing the multipulse principle for measurement and providing an output signal linear with flow. The transducers shall be of wide beam design, capable of employing both clamp-on direct and reflect configuration. The flow metering system shall consist of an ultrasonic single or dual channel flow computer, individual flow data displays for each channel, metallic transducers, pipe mounting hardware and transducer cables.
 2. Provide a Controlotron (Siemens Sitrans) 1010 EDNI dual channel energy flow meter (with matched supply and return water temperature sensors) for hot and chilled water KWH energy usage measurement.
 3. Refer to mechanical drawings for quantity and location.
- U. Water differential pressure sensor: Provide industrial grade differential pressure sensors for chilled and hot water application. Refer to mechanical drawings for quantity and location. Output shall be 4-20ma. Manufacturer: Rosemount 1151DP or equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that conditioned power supply is available to control units and operator workstation.
- B. Verify that duct, pipe, and equipment-mounted devices and wiring are installed before proceeding with installation.

3.2 INSTALLATION

- A. Install equipment level and plumb.

- B. Install software in control units and operator workstation. Implement all features of programs to specified requirements and as appropriate to sequence of operation.
- C. Connect and configure equipment and software to achieve sequence of operation specified.
- D. Verify location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation.
- E. Install averaging elements in ducts and plenums in crossing or zigzag pattern.
- F. Install guards on thermostats in the following locations:
 - 1. Entrances.
 - 2. Public areas.
 - 3. Where indicated.
- G. Install automatic dampers according to Division 23 Section "Duct Accessories."
- H. Install damper motors on outside of duct not in locations exposed to outdoor temperatures.
- I. Install labels and nameplates to identify control components according to Division 23 Section "Mechanical Identification."
- J. Install hydronic instrument wells, valves, and other accessories according to Division 23 Section "Hydronic Piping."
- K. Install duct volume-control dampers according to Division 23 Sections specifying air ducts.

3.3 ELECTRICAL WIRING AND CONNECTION INSTALLATION

- A. Install raceways, boxes, and cabinets according to Division 26 Section "Raceways and Boxes".
- B. Install building wire and cable according to Division 26 Section "Low Voltage Electrical Power Conductors and Cables".
- C. Install signal and communication cable according to Division 27 Section "Communications Horizontal Cabling"
 - 1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
 - 2. Install exposed cable in EMT conduit.
 - 3. Install concealed cable in EMT conduit.
 - 4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.
 - 5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
 - 6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cable.
 - 7. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.
 - 8. Plenum rated wire acceptable in accessible ceiling plenum locations.
- D. Connect manual-reset limit controls independent of manual-control switch positions.

- E. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.
- F. Install all line voltage wiring, concealed or exposed in EMT in accordance with Division 26 specifications, local electric code and the NEC.
- G. Provide extensions of 120 volt, 20 amp circuit and circuit breakers from junction boxes and/or emergency or normal power panel boards for all DDC panels and terminal box controls as required for a complete operating system. Coordinate with Division 26.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test and adjust field-assembled components and equipment installation, including connections and assistance in field testing. Report results in writing.
- B. Prepare the following field tests and inspections and prepare test report:
 - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.
 - 2. Test and adjust controls and safeties.
 - 3. Test each point through its full operating range to verify that safety and operating control setpoints are as required.
 - 4. Test each control loop to verify stable mode of operation and compliance with sequence of operations. Adjust PID actions. Provide and submit functional test reports as required documenting smooth and stable operation of all PID loops for all HVAC systems.
 - 5. Test each system for compliance with sequence of operations.
 - 6. Test hardware and software interlocks.
- C. DDC Verification:
 - 1. Verify that instruments are installed before calibration, testing, and loop or leak checks.
 - 2. Check instruments for proper location and accessibility.
 - 3. Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.
 - 4. Check flow instruments. Inspect tag number and line and bore size, and verify that inlet side is identified and that meters are installed properly.
 - 5. Check pressure instruments, piping slope, installation of valve manifold and self contained pressure regulators.
 - 6. Check temperature instruments and material and length of sensing element.
 - 7. Check control valves. Verify that they are in correct direction.
 - 8. Check DDC system as follows: Verify that the DDC controller power supply is from emergency power if applicable. Verify that the wires at control panels are tagged with their service designation and approved tagging. Verify that spare I/O capacity has been provided. Verify that DDC controllers are protected from power supply surges.
- D. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

3.5 ADJUSTMENT

- A. Calibrating and Adjusting:
 - 1. Calibrate instruments.

2. Make three-point calibration test for both linearity and accuracy for each analog instrument.
 3. Calibrate equipment and procedures using manufacturer's written recommendations and instrument manuals. Use test equipment with accuracy at least double that of instrument being calibrated.
 4. Control System Inputs and Outputs:
 - a. Check analog inputs at 0, 50 and 100 percent.
 - b. Check analog outputs using milliampere meter at 0, 50 and 100 percent.
 - c. Check digital inputs using a jumper cable.
 - d. Check digital outputs using ohmmeter to test for contact making or breaking.
 - e. Check resistance temperature inputs at 0, 50, and 100 percent of span using precision resistant source.
 5. Flow:
 - a. Set differential pressure flow transmitters for 0 and 100 percent values with 3 point calibration accomplished at 50, 90, and 100 percent of span.
 - b. Manually operate flow switches to verify that they make or break contact.
 6. Pressure:
 - a. Calibrate pressure transmitters at 0, 50, and 100 percent.
 - b. Calibrate pressure switches to make or break contacts, with adjustable differential set at minimum.
 7. Temperature:
 - a. Calibrate resistance transmitters at 0, 50, and 100 percent of span using a precision resistance source.
 - b. Calibrate temperature switches to make or break contacts.
 8. Stroke and adjust control valves and dampers following the manufacturers recommended procedure.
 9. Provide diagnostic and test instruments for calibration and adjustment of system.
 10. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures.
- B. Adjust initial temperature and humidity setpoints.
- C. Occupancy Adjustment:
- 3.6 DEMONSTRATION
- A. Engage a factory-authorized service representative to train the City of New York's maintenance personnel to adjust, operate, and maintain HVAC instruments and controls. Refer toDDC General Conditions.
 - B. The BCS contractor shall be responsible for the startup, commissioning, and demonstration of the control systems as specified in this section. BCS point to point, functional verification and commissioning shall be coordinated with the City of New York, Construction Manager, Testing and Balancing Agency, HVAC and electrical contractors, and the third party commissioning agent (CA). The BCS contractor shall notify all parties required when all systems pre-commissioning and testing is complete and 100% ready for verification by the third part

commissioning agent. The commissioning agent shall be present and shall be notified of any testing and balancing and/or commissioning scheduled with the construction manager. The BCS contractor shall be present at all commissioning meetings and scheduled field verification inspections. BCS contractor shall make good any defects which do not comply with the contract documents.

END OF SECTION 23 09 00

SECTION 23 09 93 – SEQUENCE OF OPERATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Provide commissioning as per third party commissioning agent requirements. Refer to commissioning specification for requirements.

1.2 SUMMARY

- A. This Section includes control equipment for HVAC systems and components.

1.3 DEFINITIONS

- A. DDC: Direct-Digital Controls.
- B. BCS: Building Control System
- C. AFS: Air Flow Sensor
- D. SPS: Static Pressure Sensor
- E. DPS: Differential Pressure Sensor
- F. EM: Energy Meter
- G. FAS: Fire Alarm System
- H. BLN: Building Level Network.
- I. FLN: Field Level Network.
- J. PID: Proportional Integral and Derivative
- K. VFD: Variable Frequency Drive
- L. M+V: Measurement and Verification

1.4 SEQUENCE OF OPERATIONS

- A. FCU M-4 and FCU 2-3:

- 1. General:

- a. VAV terminal box damper, modulating type, normally closed.
 - b. Cooling coil control valve, modulating type, normally closed.
 - c. Heating coil control valve, modulating type, normally closed.
 - d. Finned tube radiator control valve, modulating type, fail last position.
 - e. Supply fan VFD, modulating type, 0% speed output.

2. Hardwired safeties:
 - a. Duct smoke detectors (refer to mechanical drawings for locations) shall stop associated FCU supply fan on presence of smoke. Controls contractor shall provide interface wiring, conduit, relays, etc. From the fan module to the VFD shutdown circuit.
3. System off:
 - a. When the system is off all valves, dampers and controlled devices shall be in their normal position as stated above.
4. System start-up:
 - a. The system shall run based on a time of day schedule or via a manual command from the DDC operator workstation.
 - b. The fan coil unit supply fan VFD shall start and ramp up to the minimum speed setting. The VAV terminal box damper shall be indexed to the minimum VAV terminal box damper cfm setting (coordinate the minimum and maximum VAV terminal box damper cfm settings with mechanical schedule and the balancing contractor).
5. Temperature control:
 - a. On a call for heating the finned tube radiator shall be modulated up to 100% open to maintain the discharge air temperature at setpoint. On a further call for heating the fan coil unit heating coil control valve shall be modulated in sequence to maintain the discharge air temperature at setpoint. The fan coil unit cooling coil control valve shall be closed.
 - b. On a call for cooling the fan coil unit cooling coil control valve shall be modulated to maintain the discharge air temperature at setpoint. The finned tube radiator and the heating coil control valve shall be closed.
 - c. On a further call for cooling the fan coil unit supply fan VFD shall modulate up from the minimum to the maximum VFD speed setting as required to maintain the discharge air temperature at setpoint. Coordinate the supply fan minimum and maximum speed settings with the mechanical schedules and the balancing contractor. On a drop in space temperature the reverse shall occur.
 - d. The discharge air temperature shall be reset up or down to maintain the space temperature at the summer setpoint of 74degF or the winter setpoint of 72degF (adjustable).
 - e. Theatre one: the discharge air temperature shall be reset up or down to maintain the average of two space temperature sensors at the summer setpoint of 74degF or the winter setpoint of 72degF (adjustable).
6. Dehumidification control mode:
 - a. When the space humidity rises above 60%rh (adjustable) the normal temperature control mode shall be disabled. The fan coil unit cooling coil control valve shall be modulated up incrementally until the space humidity drops below setpoint. The fan coil unit heating coil control valve shall be modulated as required to maintain the space temperature at setpoint. The dehumidification mode shall be disabled when the space humidity drops below 50%rh (adjustable) for 20 minutes (adjustable).

7. CO2 control:
 - a. The carbon dioxide levels in the space shall be compared to the CO2 levels in the outside air. The CO2 levels in the space shall not be allowed to exceed the outside air CO2 levels by more than 550ppm.
 - b. If the carbon dioxide levels in any of the associated spaces rise above the allowable CO2 ppm setpoint (adjustable) the VAV terminal box damper shall be modulated between the minimum and the maximum VAV terminal box damper cfm setting to allow more supply make-up air into the associated space.
 - c. If the carbon dioxide levels in any of the associated spaces drop below the allowable CO2 ppm setpoint (adjustable) the VAV terminal box damper shall be modulated between the maximum and the minimum VAV terminal box damper cfm settings to allow less supply make-up air into the associated space.
 8. Leak detection:
 - a. When leak detector indicates a leak, all associated FCU chilled water and hot water control valves shall be closed. An alarm shall be raised at the operator workstation.
 9. Measurement and verification:
 - a. The DDC shall monitor, totalize and record calculated energy used by the FCU supply fan via VFD integration (kWh's).
 10. Make-up AHU failure mode:
 - a. If the make-up AHU shuts down in a failure mode when the FCU is running the FCU VAV terminal box damper shall close. The FCU shall continue to run in the full recirculation mode.
- B. FCU M-1 and FCU 2-1:
1. General:
 - a. VAV terminal box damper, modulating type, normally closed.
 - b. Cooling coil control valve, modulating type, normally closed.
 - c. Heating coil control valve, modulating type, normally closed.
 - d. Finned tube radiator control valve, modulating type, fail last position.
 - e. Supply fan VFD, modulating type, 0% speed output.
 2. Hardwired safeties:
 - a. Duct smoke detectors (refer to mechanical drawings for location) shall stop associated FCU supply fan on presence of smoke. Controls contractor shall provide interface wiring, conduit, relays, etc. From the fas module to the VFD shutdown circuit.
 3. System off:
 - a. When the system is off all valves, dampers and controlled devices shall be in their normal position as stated above.
 4. System start-up:

- a. The system shall run based on a time of day schedule or via a manual command from the DDC operator workstation.
 - b. The fan coil unit supply fan VFD shall start and ramp up to the minimum speed setting. The VAV terminal box damper shall be indexed to the minimum VAV terminal box damper cfm setting (coordinate the minimum and maximum VAV terminal box damper cfm setting with mechanical schedule and the balancing contractor).
5. Temperature control:
- a. On a call for heating the finned tube radiator shall be modulated up to 100% open to maintain the discharge air temperature at setpoint. On a further call for heating the fan coil unit heating coil control valve shall be modulated in sequence to maintain the discharge air temperature at setpoint. The fan coil unit cooling coil control valve shall be closed.
 - b. North lounge and corridor area: on a call for perimeter heating (via perimeter temperature sensor) the finned tube radiator control valve shall be modulated to maintain the north lounge area temperature at setpoint (adjustable). On a further call for heating the fan coil unit heating coil control valve shall be modulated to maintain the discharge air temperature at setpoint.
 - c. On a call for cooling the fan coil unit cooling coil control valve shall be modulated to maintain the discharge air temperature at setpoint. The finned tube radiator and the heating coil control valve shall be closed.
 - d. On a further call for cooling the fan coil unit supply fan VFD shall modulate up from the minimum to the maximum VFD speed setting as required to maintain the discharge air temperature at setpoint. Coordinate the supply fan minimum and maximum speed settings with the mechanical schedules and the balancing contractor. On a drop in space temperature the reverse shall occur.
 - e. The discharge air temperature shall be reset up or down to maintain the space temperature at the summer setpoint of 74degF or the winter setpoint of 72degF (adjustable).
6. Dehumidification control mode:
- a. When the space humidity rises above 60%rh (adjustable) the normal temperature control mode shall be disabled. The fan coil unit cooling coil control valve shall be modulated up incrementally until the space humidity drops below setpoint. The fan coil unit heating coil control valve shall be modulated as required to maintain the space temperature at setpoint. The dehumidification mode shall be disabled when the space humidity drops below 50%rh (adjustable) for 20 minutes (adjustable).
7. CO2 control:
- a. The carbon dioxide levels in the space shall be compared to the CO2 levels in the outside air. The CO2 levels in the space shall not be allowed to exceed the outside air CO2 levels by more than 550ppm.
 - b. If the carbon dioxide levels in any of the associated spaces rise above the allowable CO2 ppm setpoint (adjustable) the VAV terminal box damper shall be modulated between the minimum and the maximum VAV terminal box damper cfm setting to allow more supply make-up air into the associated space.
 - c. If the carbon dioxide levels in any of the associated spaces drop below the allowable CO2 ppm setpoint (adjustable) the VAV terminal box damper shall be modulated between the maximum and minimum VAV terminal box damper cfm settings to allow less supply make-up air into the associated space.

8. Leak detection:
 - a. When leak detector indicates a leak, all associated FCU chilled water and hot water control valves shall be closed. An alarm shall be raised at the operator workstation.
 9. Measurement and verification:
 - a. The DDC shall monitor, totalize and record calculated energy used by the FCU supply fan via VFD integration (kWh's).
 10. Make-up AHU failure mode:
 - a. If the make-up AHU shuts down in a failure mode when the FCU is running the FCU VAV terminal box damper shall close. The FCU shall continue to run in the full recirculation mode.
- C. FCU G-1, FCU M-2, FCU M-3, FCU M-5, FCU 2-2, and FCU 2-4:
1. General:
 - a. VAV terminal box damper, modulating, normally closed.
 - b. Heating coil control valve, modulating type, normally closed.
 - c. Cooling coil control valve, modulating type, normally closed.
 - d. Supply fan, 2 speed (low and high), off.
 2. System off:
 - a. When the system is off all valves, dampers and controlled devices shall be in their normal position as stated above.
 3. System start-up:
 - a. The system shall run based on occupancy or via a manual command from the DDC operator workstation.
 - b. The fan coil unit shall start at the low speed setting based on detection of occupancy via the occupancy sensor in the associated space. The VAV terminal box damper shall open to the minimum airflow position.
 - c. The fan coil unit shall shutdown when the space is unoccupied via the occupancy sensor for 15 minutes (adjustable). The VAV terminal box damper shall close.
 - d. Prop shop exhaust control: the prop shop exhaust fan shall be indexed on-off via a local switch. When the exhaust fan is enabled the VAV terminal box damper shall be indexed to the maximum airflow position. The fan coil unit supply fan shall be indexed to the high speed setting. When the prop shop exhaust fan is disabled the VAV terminal box damper shall be indexed back to the minimum position and the fan coil unit supply fan shall be controlled to maintain normal temperature control as described below.
 4. Temperature control:
 - a. The fan coil unit heating and the cooling coil control valve shall be modulated in sequence to maintain the discharge air temperature at setpoint.

- b. On a further call for cooling the fan coil unit fan speed shall index up to the high speed setting (provide dead band time delay to prevent short cycling when indexing fan speed settings) to maintain the discharge air temperature setpoint. On a drop in space temperature the reverse shall occur.
 - c. The discharge air temperature shall be reset up or down to maintain the space temperature at the summer setpoint of 74degF or the winter setpoint of 72degF (adjustable).
5. Leak detection:
- a. When leak detector indicates a leak, all associated FCU chilled water and hot water control valves shall be closed. An alarm shall be raised at the operator workstation.
6. Measurement and verification:
- a. The DDC system shall monitor, totalize and record run time totals (low and high speed settings) for each FCU. Runtime data via current switches shall be used to calculate energy usage in kWh's.
 - b. The prop shop exhaust fan runtime data shall be totalized via current switches. The runtime data shall be used to calculate energy usage in kWh's.
7. Make-up AHU failure mode:
- a. If the make-up AHU shuts down in a failure mode when the FCU is running the FCU VAV terminal box damper shall close. The FCU shall continue to run in the full recirculation mode.
- D. Miscellaneous sequences:
- 1. Unit heater control:
 - a. Local thermostat shall cycle unit heater and fan on-off to maintain the space temperature setpoint.
 - 2. Relief air damper control:
 - a. Occupied mode: when any fan coil unit is enabled to run the relief air damper shall open.
 - b. Unoccupied mode: when all fan coil units are disabled the relief air damper shall close.
 - c. The building control system shall monitor the open/closed status of the relief air damper.
 - 3. Measurement and verification (outside airflow and supply temperature measurement)
 - a. The outside airflow and supply air temperature delivered to each VAV terminal box (refer to the mechanical riser diagrams for quantity and locations) shall be monitored, totalized and recorded (kWh's) by the DDC workstation.
 - 4. Measurement and verification (chilled water energy usage)
 - a. The chilled water energy usage (energy meter including flow and supply and return chilled water temperature) shall be monitored, totalized and recorded

(kWh's) for each floor zone by the DDC workstation (refer to mechanical riser drawings for quantity and location).

5. Measurement and verification (hot water energy usage)
 - a. The hot water energy usage (energy usage including flow and supply and return water temperature) shall be monitored, totalized and recorded (kWh's) for each floor zone by the DDC workstation (refer to mechanical riser drawings for quantity and location).
6. Measurement and verification (electrical energy usage)
 - a. The electrical energy usage (electrical kWh meter provided by Division 26) shall be monitored, totalized and recorded (kWh's) by the DDC workstation.
7. Measurement and verification (lighting control panels electrical energy usage)
 - a. The electrical energy usage (electrical kWh meters provided by Division 26) shall be monitored, totalized and recorded (kWh's) by the DDC workstation.
8. Measurement and verification (domestic water meter)
 - a. The domestic water meter (provided by the plumbing contractor) total water usage shall be monitored, totalized and recorded by the DDC workstation.

PART 2 - (NOT USED)

PART 3 - (NOT USED)

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SECTION 23 21 13 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes pipe and fitting materials, joining methods, special-duty valves, and specialties for the following:
 - 1. Hot-water heating piping.
 - 2. Chilled-water piping.
 - 3. Condensate-drain piping.

1.3 PERFORMANCE REQUIREMENTS

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature:
 - 1. Hot-Water Heating Piping: 125 psig at 200 deg F.
 - 2. Chilled-Water Piping: 150 psig at 100 deg F.
 - 3. Condensate-Drain Piping: 150 deg F

1.4 SUBMITTALS

- A. Product Data: For each type of the following:
 - 1. Plastic pipe and fittings with solvent cement.
 - 2. Valves. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
 - 3. Air control devices.
 - 4. Hydronic specialties.
- B. Shop Drawings: Detail, at 3/8" scale, the piping layout, fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to the building structure. Detail location of anchors, alignment guides, and expansion joints and loops.
- C. Welding certificates.
- D. Qualification Data: For Installer.
- E. Field quality-control test reports.
- F. Operation and Maintenance Data: For air control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installers of Pressure-Sealed Joints: Installers shall be authorized by the pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.

B. Steel Support Welding: Qualify processes and operators according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

D. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 01.

1.6 EXTRA MATERIALS

A. Differential Pressure Meter: For each type of balancing valve and automatic flow control valve, include flowmeter, probes, hoses, flow charts, and carrying case.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L (ASTM B 88M, Type B)

B. Annealed-Temper Copper Tubing: ASTM B 88, Type K (ASTM B 88M, Type A).

C. Wrought-Copper Fittings: ASME B16.22.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Anvil International, Inc.
- b. S. P. Fittings; a division of Star Pipe Products.

D. Wrought-Copper Unions: ASME B16.22.

2.2 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; type, grade, and wall thickness as indicated in Part 3 "Piping Applications" Article.

B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in Part 3 "Piping Applications" Article.

- C. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in Part 3 "Piping Applications" Article.
- D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in Part 3 "Piping Applications" Article.
- E. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced as indicated in Part 3 "Piping Applications" Article.
- F. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.
- G. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - 1. Material Group: 1.1.
 - 2. End Connections: Butt welding.
 - 3. Facings: Raised face.
- H. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.

2.3 PLASTIC PIPE AND FITTINGS

- A. CPVC Plastic Pipe: ASTM F 441/F 441M, Schedules 40 and 80, plain ends as indicated in Part 3 "Piping Applications" Article.
- B. CPVC Plastic Pipe Fittings: Socket-type pipe fittings, ASTM F 438 for Schedule 40 pipe; ASTM F 439 for Schedule 80 pipe.
- C. PVC Plastic Pipe: ASTM D 1785, Schedules 40 and 80, plain ends as indicated in Part 3 "Piping Applications" Article.
- D. PVC Plastic Pipe Fittings: Socket-type pipe fittings, ASTM D 2466 for Schedule 40 pipe; ASTM D 2467 for Schedule 80 pipe.

2.4 JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. Klingersil only approved manufacturer.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- F. Solvent Cements for Joining Plastic Piping:
 - 1. CPVC Piping: ASTM F 493.
 - 2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
- G. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

2.5 TRANSITION FITTINGS

- A. Plastic-to-Metal Transition Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Charlotte Pipe and Foundry Company.
 - b. IPEX Inc.
 - c. KBi.
 - 2. PVCone-piece fitting with one threaded brass or copper insert and one Schedule 80 solvent-cement-joint end.
- B. Plastic-to-Metal Transition Unions:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Charlotte Pipe and Foundry Company.
 - b. IPEX Inc.
 - c. KBi.
 - d. NIBCO INC.
 - 2. MSS SP-107, PVCunion. Include brass or copper end, Schedule 80 solvent-cement-joint end, rubber gasket, and threaded union.

2.6 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper-alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions:
 - 1. Dielectric Unions are prohibited.
- D. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Factory-fabricated companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

E. Dielectric-Flange Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Central Plastics Company.
 - d. Pipeline Seal and Insulator, Inc.
2. Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
3. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig (1035- or 2070-kPa) minimum working pressure where required to suit system pressures.

F. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Victaulic Company of America.
2. Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.
3. Provide isolation valve upstream of all dielectric nipples.

2.7 VALVES

- A. Gate, Globe, Check, Ball, and Butterfly Valves: Comply with requirements specified in Division 23 Section "General-Duty Valves for HVAC Piping."
- B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Division 23 Section "Instrumentation and Control for HVAC."
- C. Bronze, Calibrated-Orifice, Balancing Valves:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bell & Gossett Domestic Pump; a division of ITT Industries.
 - b. Taco.
 2. Body: Bronze, ball or plug type with calibrated orifice or venturi.

3. Ball: Brass or stainless steel.
 4. Plug: Resin.
 5. Seat: PTFE.
 6. End Connections: Threaded or socket.
 7. Pressure Gage Connections: Integral seals for portable differential pressure meter.
 8. Handle Style: Lever, with memory stop to retain set position.
 9. CWP Rating: Minimum 125 psig.
 10. Maximum Operating Temperature: 250 deg F.
- D. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bell & Gossett Domestic Pump; a division of ITT Industries.
 - b. Taco.
 - c. Tour & Andersson; available through Victaulic Company of America.
 2. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
 3. Ball: Brass or stainless steel.
 4. Stem Seals: EPDM O-rings.
 5. Disc: Glass and carbon-filled PTFE.
 6. Seat: PTFE.
 7. End Connections: Flanged or grooved.
 8. Pressure Gage Connections: Integral seals for portable differential pressure meter.
 9. Handle Style: Lever, with memory stop to retain set position.
 10. CWP Rating: Minimum 125 psig.
 11. Maximum Operating Temperature: 250 deg F.
- E. Diaphragm-Operated, Pressure-Reducing Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 2. Body: Bronze or brass.
 3. Disc: Glass and carbon-filled PTFE.
 4. Seat: Brass.
 5. Stem Seals: EPDM O-rings.
 6. Diaphragm: EPT.
 7. Low inlet-pressure check valve.
 8. Inlet Strainer: Stainless steel, removable without system shutdown.
 9. Valve Seat and Stem: Noncorrosive.
 10. Valve Size, Capacity, and Operating Pressure: Selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.
- F. Diaphragm-Operated Safety Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Body: Bronze or brass.
3. Disc: Glass and carbon-filled PTFE.
4. Seat: Brass.
5. Stem Seals: EPDM O-rings.
6. Diaphragm: EPT.
7. Wetted, Internal Work Parts: Brass and rubber.
8. Inlet Strainer: Stainless steel, removable without system shutdown.
9. Valve Seat and Stem: Noncorrosive.
10. Valve Size, Capacity, and Operating Pressure: Comply with ASME Boiler and Pressure Vessel Code: Section IV, and selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

G. Automatic Flow Limiting Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Flow Design Inc.
 - b. Griswold Controls.
2. Body: Brass or ferrous metal.
3. Piston and Spring Assembly: Stainless steel tamper proof, self cleaning, and removable.
4. Combination Assemblies: Include bronze or brass-alloy ball valve.
5. Identification Tag: Marked with zone identification, valve number, and flow rate.
6. Size: Same as pipe in which installed.
7. Performance: Maintain constant flow, plus or minus 5 percent over system pressure fluctuations.
8. Minimum CWP Rating: 175 psig.
9. Maximum Operating Temperature: 200 deg F.

2.8 AIR CONTROL DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Spirax Sarco
 2. Spirotherm
- B. Manual Air Vents:
1. Apollo 70 series stainless ball and stem
- C. Automatic Air Vents:
1. Primary Chilled Water
 - a. Spirotherm 300#
 2. Other Hydronic Systems and Equipment
 - a. Spirotherm 300#

2.9 HYDRONIC PIPING SPECIALTIES

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger. Provide a 3/4" blowdown ball valve and hose bibb connection on all strainers.
3. Strainer Screen: 60-mesh startup strainer, 0.125" perforation or manufacturer's standard screen.
4. Hot-water heating piping, NPS 2 and smaller
 - a. Spirax Sarco bronze model BT or TBT
 - b. Spirax Sarco cast iron model IT
5. Hot-water heating piping, NPS 2-1/2 and larger
 - a. Spirax Sarco cast iron model CI-125
6. Primary chilled water piping, NPS 2 and smaller
 - a. Spirax Sarco bronze model BT or TBT
 - b. Spirax Sarco cast iron model IT (250# rated)
7. Primary chilled water piping, NPS 2-1/2 and larger
 - a. Spirax Sarco cast steel flanged 150#
8. Secondary chilled water piping, NPS 2 and smaller
 - a. Spirax Sarco bronze model BT or TBT
 - b. Spirax Sarco cast iron model IT
9. Secondary chilled water piping, NPS 2-1/2 and larger
 - a. Spirax Sarco cast iron model CI-125

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Hot-water heating piping, aboveground, NPS 2 and smaller, shall be the following:
 1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.
- B. Hot-water heating piping, aboveground, NPS 2-1/2 and larger, shall be the following:
 1. Schedule 40 steel pipe, butt welded joints.
- C. Chilled-water piping, aboveground, NPS 2 and smaller shall be any of the following:
 1. Type L drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

D. Chilled-water piping, aboveground, NPS 2-1/2 and larger, shall be the following:

1. Schedule 40 steel pipe, butt welded joints.

E. Condensate-Drain Piping: Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints or Schedule 40 PVC plastic pipe and fittings and solvent-welded joints.

3.2 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains, and at supply connection to each piece of equipment.

B. Install calibrated-orifice, balancing valves at each branch connection to return main.

C. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.

D. Install check valves at each pump discharge and elsewhere as required to control flow direction.

3.3 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

- M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.
- N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.
- O. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.
- P. Install valves according to Division 23 Section "General-Duty Valves for HVAC Piping."
- Q. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
- R. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.
- S. Install strainers on inlet side of each control valve, pressure-reducing valve, solenoid valve, in-line pump, and elsewhere as indicated. Install NPS 3/4 nipple and ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2.
- T. Install expansion loops, expansion joints, anchors, and pipe alignment guides as specified in Division 23 Section "Expansion Fittings and Loops for HVAC Piping."
- U. Identify piping as specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.4 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor devices are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment." Comply with the following requirements for maximum spacing of supports.
- B. Seismic restraints are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
- C. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
 - 2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
 - 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
 - 4. Spring hangers to support vertical runs.
 - 5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
 - 6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.
- D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 3/4: Maximum span, 7 feet; minimum rod size, 3/8 inch.
 - 2. NPS 1: Maximum span, 7 feet; minimum rod size, 3/8 inch).
 - 3. NPS 1-1/4: Maximum span, 7 feet; minimum rod size, 3/8 inch.

4. NPS 1-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
 5. NPS 2: Maximum span, 10 feet; minimum rod size, 3/8 inch.
 6. NPS 2-1/2: Maximum span, 11 feet; minimum rod size, 1/2 inch.
 7. NPS 3: Maximum span, 12 feet; minimum rod size, 1/2 inch.
 8. NPS 3-1/2: Maximum span, 13 feet; minimum rod size, 1/2 inch.
 9. NPS 4: Maximum span, 14 feet; minimum rod size, 5/8 inch.
 10. NPS 5: Maximum span, 16 feet; minimum rod size, 5/8 inch.
 11. NPS 6: Maximum span, 17 feet; minimum rod size, 3/4 inch.
 12. NPS 8: Maximum span, 19 feet; minimum rod size, 3/4 inch. NPS 10: Maximum span, 22 feet; minimum rod size, 7/8 inch.
 13. NPS 12: Maximum span, 23 feet; minimum rod size, 7/8 inch.
 14. NPS 14: Maximum span, 25 feet; minimum rod size, 1 inch.
 15. NPS 16: Maximum span, 27 feet; minimum rod size, 1 inch.
 16. NPS 18: Maximum span, 28 feet; minimum rod size, 1 inch.
 17. NPS 20: Maximum span, 30 feet; minimum rod size, 1-1/4.
- E. Install hangers for drawn-temper copper tubing with the following maximum spacing and minimum rod sizes:
1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 3/8 inch.
 2. NPS 1: Maximum span, 6 feet; minimum rod size, 3/8 inch.
 3. NPS 1-1/4: Maximum span, 7 feet; minimum rod size, 3/8 inch.
 4. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 5. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 6. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 1/2 inch.
 7. NPS 3: Maximum span, 10 feet; minimum rod size, 1/2 inch.
- F. Plastic Piping Hanger Spacing: Space hangers according to pipe manufacturer's written instructions for service conditions. Avoid point loading. Space and install hangers with the fewest practical rigid anchor points.
- G. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

3.5 PIPE JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- F. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
 - G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
 - H. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 3. PVC Pressure Piping: Join ASTM D 1785 schedule number, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule number PVC pipe and socket fittings according to ASTM D 2855.
 4. PVC Nonpressure Piping: Join according to ASTM D 2855.
- 3.6 HYDRONIC SPECIALTIES INSTALLATION
- A. Install manual air vents at all local high/low points in piping, at heat-transfer coils, and elsewhere as required for system air venting. Pipe manual vents clear of riser insulation.
 - B. Install automatic air vents at high points of system piping at major piping risers. Manual vents at heat-transfer coils and elsewhere as required for air venting. In locations where manual vents will not be readily accessible, provide automatic air vents and provide drain piping from air vent to nearest usable floor drain.
 - C. Install piping from boiler air outlet, air separator, or air purger to expansion tank with a 2 percent upward slope toward tank.
 - D. Install in-line air separators in pump suction. Install drain valve on air separators NPS 2 and larger.
 - E. Install tangential air separator in pump suction. Install blowdown piping with gate or full-port ball valve; extend full size to nearest floor drain.
 - F. Install expansion tanks on the floor. Vent and purge air from hydronic system, and ensure tank is properly charged with air to suit system Project requirements.

3.7 TERMINAL-EQUIPMENT CONNECTIONS

- A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.
- B. Install control valves in accessible locations close to connected equipment.
- C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.
- D. Install ports for pressure gages and thermometers at coil inlet and outlet connections according to Division 23 Section "Meters and Gages for HVAC Piping."

3.8 FIELD QUALITY CONTROL

- A. Prepare hydronic piping according to ASME B31.9 and as follows:
1. Leave joints, including welds, uninsulated and exposed for examination during test.
 2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
 3. Install temporary spool piece and flush hydronic piping systems with clean water; then remove and replace strainer screens.
 4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
 5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.
- B. Perform the following tests on hydronic piping:
1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
 2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
 3. Isolate expansion tanks and determine that hydronic system is full of water.
 4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
 5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
 6. Prepare written report of testing.
- C. Perform the following before operating the system:
1. Open manual valves fully.
 2. Inspect pumps for proper rotation.
 3. Set makeup pressure-reducing valves for required system pressure.
 4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
 5. Set temperature controls so all coils are calling for full flow.
 6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
 7. Verify lubrication of motors and bearings.

END OF SECTION 23 21 13

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SECTION 23 31 13 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 230500 shall also govern work specified together with all applicable paragraphs of other Division 23 sections.

1.2 SUMMARY

A. Section Includes:

- 1. Single-wall rectangular ducts and fittings.
- 2. Double-wall rectangular ducts and fittings.
- 3. Single-wall round and flat-oval ducts and fittings.
- 4. Double-wall round and flat-oval ducts and fittings.
- 5. Sheet metal materials.
- 6. Duct liner.
- 7. Sealants and gaskets.
- 8. Hangers and supports.

B. Related Sections:

- 1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
- 2. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2007.

1.4 SUBMITTALS

A. Product Data: For each type of the following products:

- 1. Liners and adhesives.
- 2. Sealants and gaskets.

B. Shop Drawings:

- 1. Prior to fabrication of ductwork, submit "shop standards," including (but not limited to)

- a. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
 - b. Factory- and shop-fabricated ducts and fittings.
 - c. Duct layout indicating sizes, configuration, materials, metal gauges, liner material, extend of internal lining, and static-pressure classes, changes in pressure class, transitions.
 - d. Elevation of top of ducts.
 - e. Dimensions of main duct runs from building grid lines.
 - f. Fittings.
 - g. Reinforcement and spacing.
 - h. Seam and joint construction.
 - i. Penetrations through fire-rated and other partitions.
 - j. Equipment installation based on equipment being used on Project.
 - k. Locations for duct accessories, including volume dampers, fire & smoke dampers, turning vanes, and access doors and panels.
 - l. Hangers and supports, including methods for duct and building attachment, and vibration isolation. Submit structural calculations (refer to §1.4.D.5).
2. Submit test reports for the following
- a. Flamespread of resins (refer to UL-723).
 - b. Air leakage (refer to §3.9.B).
- C. Delegated-Design Submittal:
1. Sheet metal thicknesses.
 2. Joint and seam construction and sealing.
 3. Reinforcement details and spacing.
 4. Materials, fabrication, assembly, and spacing of hangers and supports.
 5. Design Calculations: Calculations, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation for selecting hangers and supports.
- D. Coordination Drawings: Dimensioned plans, drawn at 3/8" = 1'-0" scale, on which the following items are shown and coordinated with each other, with each trade in a separate color, using input from installers of the items involved:
1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout. Unless otherwise noted, duct sizes shown on the contract drawings are clear internal airway dimensions, and allowance shall be made for internal lining as appropriate.
 2. Suspended ceiling components.
 3. Structural members to which duct will be attached.
 4. Size and location of initial access modules for acoustical tile.
 5. Penetrations of smoke barriers and fire-rated construction.
 6. HVAC piping runs.
 7. Required openings in structural and architectural systems.
 8. Location of supports and suspension systems.
 9. Locations and critical dimensions of structural steel
 10. Major electrical conduit and cable tray routes
 11. Dimensions of actual equipment to be installed
 12. Dimensioned code compliant equipment access including access door locations and swings

13. All conflicts between trades should be resolved prior to submission to the Architect/Engineer.
14. Locations of walls and partitions, doors, door swings, lighting and all other information required to assure complete coordination among the various trades
15. Items penetrating finished ceiling with sizes and elevations including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers and piping runs.
 - e. Access panels.
 - f. Perimeter moldings.
 - g. Plumbing piping runs.

E. Welding certificates.

F. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Reference Standards:

1. National Fire Protection Association (NFPA): NFPA No. 90-A. "Air Conditioning and Ventilating Systems".
2. Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA), 8224 Old Court House Road, Vienna, Virginia, 22180.
 - a. Balancing and Adjustment Manual: In this Specification shall mean the first edition of the "Manual for the Balancing and Adjustment of Air Distribution System".
 - b. "HVAC Duct Construction Standards-Metal and Flexible", 2005.
 - c. "Round Industrial Duct Construction Standards", 1977.
 - d. "Rectangular Industrial Duct Construction Standards", 1980.
 - e. "HVAC Air Duct Leakage Test Manual", 1985.
3. American Conference of Governmental Industrial Hygienists (ACGIH). "Industrial Ventilation-A Manual of Recommended Practice", 20th edition.
4. Factory Mutual (FM) Standard 7-78.
5. NFPA 91.
6. National Bureau of Standards (NBS) Voluntary Product Standard 15-69.
7. North American Insulation Manufacturers Association (NAIMA): "Fibrous Glass Duct Liner Standard"
8. ASTM 411-61: "Test for Hot Surface Performance of High Temperature Surface Insulation."
9. ASTM E-84/UL 723/NFPA 255: "Test for Surface Burning Characteristics of Building Materials."

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2007, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

- D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2007, Section 6.4.4 - "HVAC System Construction and Insulation."
- E. Mockups:
1. Before installing duct systems, build mockups representing static-pressure classes in excess of 3-inch wg. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
 - a. Five transverse joints.
 - b. One access door(s).
 - c. Two typical branch connections, each with at least one elbow.
 - d. Two typical flexible duct or flexible-connector connections for each duct and apparatus.
 - e. One 90-degree turn(s) with turning vanes.
 - f. One fire damper(s).
 - g. One subduct extension including stainless riser.
 - h. One Lab supply branch connection to riser.
 - i. One each lab supply and exhaust flat oval ductwork.
 - j. One 24" dia. stainless exhaust stack.
 - k. Perform leakage tests specified in "Field Quality Control" Article. Revise mockup construction and perform additional tests as required to achieve specified minimum acceptable results.
 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- F. Delivery and Storage
1. All ductwork shall be delivered to the job site in a dry and clean state.
 2. All ductwork shall be stored in a manner and location to minimize physical damage to any part of the ductwork (including internal lining), and stored in a dry and clean location.
 3. All ductwork shall be stored in a clean and dry environment and protected from dust and dirt ingress.
 4. All ductwork shall be delivered to the job site with shop-installed caps on all openings. Caps shall be made of heavy gauge polythene sheets securely taped to duct on all sides. Any ductwork not protected in this manner will be rejected and removed from the jobsite and replaced at no increase in the Contract Sum.
 5. Ductwork that has been contaminated by dust shall be cleaned in accordance with proper standards. All lined ductwork shall be cleaned using the methodology outlined in the NAIMA booklet "Cleaning Fibrous Glass Insulated Air Duct Systems."
 6. Ductwork with lining that has been contaminated by liquids shall be fully dried. Prior to installation.
 7. Installation of any damaged or refurbished ductwork shall be at the discretion of the Engineer.

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

- B. Transverse Joints: T-24 flanged with corner pieces according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Pittsburgh lock with a 3/8-inch minimum pocket according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- E. Ductwork not insulated and larger than 18" shall be either cross broken or beaded.
- F. All mitered elbows shall be provided with hollow vanes having different inside and outside curvatures, vanes shall be equal to "Ducturns" as manufactured by Tuttle and Bailey.
- G. Unless otherwise shown on the contract drawings, all elbows shall have a throat radius equal to the width of the duct in the direction of the elbow.
- H. All branch ducts shall be provided with take-off pieces including 45 degree angled sides as per SMACNA Figure 2-6. Straight taps shall not be acceptable.

2.2 DOUBLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. McGill AirFlow LLC.
 - 2. Sheet Metal Connectors, Inc.
 - 3. Approved equal.
- B. Rectangular Ducts: Fabricate ducts with indicated dimensions for the inner duct.
- C. Outer Duct: 16 gauge galvanized steel in compliance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- D. Transverse Joints: T-24 flanged with corner pieces according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- E. Longitudinal Seams: : Pittsburgh lock with a 3/8-inch minimum pocket according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

- F. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
- G. Maximum Thermal Conductivity: 0.27 Btu x in./h x sq. ft. x deg F (0.039 W/m x K) at 75 deg F (24 deg C) mean temperature.
- H. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
- I. Attach insulation to duct with adhesive with 90% minimum area coverage. Adhesive shall conform to ASTM C916.
- J. Finish insulation around access panels or other field / shop cuts with trim and seal with adhesive and edge seal.
- K. Inner Duct: 22 gauge galvanized steel in compliance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- L. Perforated galvanized sheet steel (where indicated) shall have 3/32-inch- (2.4-mm-) diameter perforations, with overall open area of 23 percent.

2.3 SINGLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Lindab Inc.
 - b. McGill AirFlow LLC.
 - c. SEMCO Incorporated.
 - d. Sheet Metal Connectors, Inc.
 - e. Spiral Manufacturing Co., Inc.
- B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).
- C. Transverse Joints: Joint RT-1 (beaded sleeve joint) and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.
- D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
 2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.
- E. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.4 DOUBLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Lindab Inc.
 2. McGill AirFlow LLC.
 3. SEMCO Incorporated.
 4. Sheet Metal Connectors, Inc.
- B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension) of the inner duct.
- C. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on static-pressure class unless otherwise indicated.
1. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - a. Transverse Joints in Ducts Larger Than 60 Inches (1524 mm) in Diameter: Flanged.
 2. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - a. Fabricate round ducts larger than 90 inches (2286 mm) in diameter with butt-welded longitudinal seams.
 - b. Fabricate flat-oval ducts larger than 72 inches (1830 mm) in width (major dimension) with butt-welded longitudinal seams.
 3. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

- D. Inner Duct: 22 gauge galvanized steel in compliance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
1. Perforated galvanized sheet steel (where indicated) shall have 3/32-inch- (2.4-mm-) diameter perforations, with overall open area of 23 percent.
- E. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
1. Maximum Thermal Conductivity: 0.27 Btu x in./h x sq. ft. x deg F (0.039 W/m x K) at 75 deg F (24 deg C) mean temperature.
 2. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
 3. Attach insulation to duct with adhesive with 90% minimum area coverage. Adhesive shall conform to ASTM C916.
 4. Finish insulation around access panels or other field / shop cuts with trim and seal with adhesive and edge seal.

2.5 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
1. Galvanized Coating Designation: G60 (Z180) both sides.
 2. Galvanized Coating Designation for external/exposed ductwork: G90 (Z275) both sides.
 3. Finishes for Surfaces Exposed to View: Mill phosphatized in compliance with ASTM D2092.
- C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.
- D. Aluminum Sheets: Comply with ASTM B 209 (ASTM B 209M) Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.
- E. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches less; 3/8-inch minimum diameter for lengths longer than 36 inches.
- G. All ductwork shall have the metal gauge visibly marked on all sections by manufacturer.

2.6 DUCT LINER

- A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Manufacturers: Subject to compliance with requirements, duct liner product will be CertainTeed Toughgard or approved equal from one of the following:

- a. Johns Manville.
- b. Knauf Insulation.
- c. Owens Corning.

2. Performance:

- a. Type 1-AL, Flexible: 0.24 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.

- 1) 1" thickness
- 2) Sound absorption coefficients and NRC shall meet or exceed the following when tested in accordance with ASTM C 423 using an "A" mounting:

<u>Octave Band Sound Absorption Coefficients</u>						
<u>125</u>	<u>250</u>	<u>500</u>	<u>1000</u>	<u>2000</u>	<u>4000</u>	<u>NRC</u>
.10	.32	.66	.84	.91	.91	.70

- b. Type 2-AL, Flexible: 0.24 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.

- 1) 2" thickness
- 2) Sound absorption coefficients and NRC shall meet or exceed the following when tested in accordance with ASTM C 423 using an "A" mounting:

<u>Octave Band Sound Absorption Coefficients</u>						
<u>125</u>	<u>250</u>	<u>500</u>	<u>1000</u>	<u>2000</u>	<u>4000</u>	<u>NRC</u>
.24	.79	1.09	1.05	1.02	1.01	1.00

- c. Type CL, Flexible High Performance: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F

- 1) 1" thickness
- 2) Noise reduction coefficient 0.75 tested in accordance with ASTM C 423 and ASTM E 795.

3. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

- a. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

4. NFPA-90A coating on side facing air stream.

- 1) Suitable for velocity up to 4000-fpm.

- B. Natural-Fiber Duct Liner: 85 percent cotton, 10 percent borate, and 5 percent polybinding fibers, treated with a microbial growth inhibitor and complying with NFPA 90A or NFPA 90B.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bonded Logic, Inc.
 - b. Reflectix Inc.
 2. Maximum Thermal Conductivity: 0.24 Btu x in./h x sq. ft. x deg F (0.034 W/m x K) at 75 deg F (24 deg C) mean temperature when tested according to ASTM C 518.
 3. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to ASTM E 84; certified by an NRTL.
 4. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.
 - a. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Insulation Pins and Washers:
1. Cupped-Head, Capacitor-Discharge-Weld Pins: zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
 2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
- D. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-19, "Flexible Duct Liner Installation."
1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
 2. Apply adhesive / edge seal to transverse edges of liner facing upstream and downstream that do not receive metal nosing.
 3. Butt transverse joints without gaps, and coat joint with adhesive.
 4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
 5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
 6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
 7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
 8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
 - a. Fan discharges.
 - b. Intervals of lined duct preceding unlined duct.
 - c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.
 9. Where an inner perforated duct is indicated on contract drawings, secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell

or as otherwise indicated on contract drawings. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.

- a. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.

10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

- E. Where round ducts are specified to be lined, use

1. Prefabricated circular fiberglass lining inserts.

2.7 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

- B. Two-Part Tape Sealing System as manufactured by Hardcast:

1. Tape: DT-5400, woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 4 inches.
3. Sealant: RTA-50, modified styrene acrylic for exterior; FTA-20 for interior.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
10. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

- C. Water-Based Joint and Seam Sealant as manufactured by Foster:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

- D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.

2. Type: S.
 3. Grade: NS.
 4. Class: 25.
 5. Use: O.
 6. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
- F. Round Duct Joint O-Ring Seals:
1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg (0.14 L/s per sq. m at 250 Pa) and shall be rated for 10-inch wg (2500-Pa) static-pressure class, positive or negative.
 2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
 3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.8 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated or galvanized low-carbon mild steel rods, full threaded or threaded at each end, two removeable nuts at each end.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Same materials as ducts, except that straps for stainless steel ducts in unfinished spaces may be galvanized steel. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."
- D. Duct Attachments: Sheet metal screws, rivets, or self-tapping metal screws; same material as duct materials.
1. Zinc or cadmium plated on galvanized duct.
 2. Minimum screw size: Number 10.
 3. Minimum rivet size: 4 pounds, blind rivets are not acceptable.
- E. Trapeze and Riser Supports:
1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
 3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.
- F. Power / Powder actuated anchors are not acceptable.
- G. Machine bolts and nuts: Galvanized or cadmium plated steel.
- H. Concrete inserts: Steel or malleable iron of the continuously slotted type of Universal inserts.
- I. Self-drilled expanding fastener: Hilti type.
- J. Expansion shields: "Star Slugin", single unit type, unless otherwise specified

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round and flat-oval ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."
- M. Install ductwork in adherence to ceiling height shown on Drawings. Establish necessary space requirements so as to maintain required clearances around all equipment.
- N. Reinforce all ducts to prevent buckling, breathing, vibrations or noise. Such reinforcing shall be as recommended in the references specified herein.
- O. Avoid penetration of ducts. Where penetrations are unavoidable ductwork details shall be based on SMACNA Figure 2-8 and agreed with the Engineer before fabrication.
- P. At exposed duct penetrations of walls, floors, and ceilings, provide sheet metal angle type escutcheons.

- Q. Duct openings: Provide openings where required to accommodate thermometers, smoke detectors, controllers, etc.
- R. Provide pilot tube openings where required for testing of systems:
 - 1. Complete with metal cap with spring device or screw to ensure against air leakage.
 - 2. For pilot tube tests install Ventlok No. 699 or 699-2 instrument.
- S. Where openings are provided in insulated ductwork, install insulation material inside metal trim angle to cover complete perimeter of insulation edge.
- T. Waterproof seams and joints in ductwork exposed to the weather by application two-part tape sealing system.
- U. At ceiling supply diffusers, extend horizontal branch duct 1 foot beyond diffuser.
- V. Cap all erected ductwork to prevent ingress of dust and dirt at the end of each working day.
- W. All ductwork shall be fully protected from damage during the construction phase.
- X. Do not use sheet metal screws in the bottom panels of ducts having soldered, welded or brazed seams.
- Y. Unless otherwise specified or shown support vertical ducts from each floor slab or by purpose made brackets fixed to the structure.
- Z. Do not suspend ducts from piping, plumbing, conduits or related supports.
 - 1. All sections of the duct designated as lined shall be completely covered with lining material and the material shall be cut to ensure tight flush butt joints without gaps. All joints shall be coated and sealed.
 - 2. Install metal nosing on all leading and trailing edges of lined ductwork.
 - 3. The ductwork lining material shall be secured with mechanical fasteners as recommended by the manufacturer and adhered to the sheet metal with a full coverage of the manufacturers recommended adhesive which shall be a UL listed adhesive. Pin length should be as recommended by the liner manufacturer. Adhesive shall not contain volatile solvents.
 - 4. Duct dimensions indicated are net inside dimensions required for airflow. Increase duct size to allow for lining / insulation thickness.

3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 INSTALLATION OF EXTERNAL DUCTWORK

- A. Construct all ducts subject to rain watertight and to insure water runoff by one or more of following techniques:
 - 1. Standing seams arranged to not act as dams.
 - 2. Entire top of duct sloped down toward side.
- B. In addition to the above, provide:
 - 1. Mastic within sheet metal joints.
 - 2. Paint two coats rust inhibiting enamel over primer.

3.4 DUCT SEALING

- A. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 2. All Ducts: Seal Class A.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, self-drilled expanding fastener, and expansion shields as appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Do not use power / powder-actuated concrete fasteners.
 - 3. Refer to 230548 (Mechanical Sound and Vibration) for isolation requirements.
 - 4. Upper attachments to be in accordance with SMACANA Figure 4-2-1, 2, 3, 6, 7, and 8 only.
 - 5. Support ductwork so that horizontal ducts are without sag or sway, vertical ducts are without buckle, and all ducts are free from the possibility of deformation, collapse, or vibration.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.6 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.7 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Leakage Tests:
 - 1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
 - 2. Testing Scope:
 - a. Test 25% of all systems outside MERs. Systems to be identified by the Engineer.
 - b. Test 100% of ductwork in MERs.
 - 3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
 - 4. Test for leaks before applying external insulation.
 - 5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
 - 6. Give seven business days' advance notice for testing for witnessing by Owner's Representative.
 - 7. Procedure:
 - a. Seal openings in ducts and plenums to be tested.
 - b. Connect test apparatus to test section using flexible duct connection or hose.
 - c. Close damper on blower suction side, to prevent excessive buildup of pressure.
 - d. Start blower and gradually open damper on suction side of blower.
 - e. Build up pressure in test section. Test supply air, return, exhaust and outside air to 100 percent of duct construction pressure rating.
 - f. Determine amount of air leakage by makeup air flow measurements.
 - g. Total allowable leakage is to be calculated using the formula $F=C_L \times p^{0.65}$
Where F = Allowable leakage per 100 square feet
 C_L = Leakage classification
 P = Duct pressure classification
 - h. Repair air leaks as required and retest when seals have cured until leakage rate is acceptable. Noise generated from duct leakage is not acceptable.
 - i. Remove temporary blanks and seals as appropriate.
 - j. Visually mark tested sections with certification sticker and initials of field test inspector.

- k. Submit certification of test results.
- C. Duct System Cleanliness Tests:
1. Visually inspect duct system to ensure that no visible contaminants are present.
 2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
 - a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.
 - b. Installation shall meet or exceed the requirements of SMACNA standard "IAQ guideline for occupied building under construction (latest edition)."
 - 1) Follow the guidelines set for by LEED (latest version) for credit 3.1 (construction IAQ management).
 - c. All temporary filters shall have a minimum efficiency of MERV-8.
- D. Duct system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.
- 3.9 DUCT CLEANING
- A. Clean new and existing duct system(s) before testing, adjusting, and balancing. Provide a minimum of 20-man days of cleaning, or as instructed by the Owner.
- B. Use service openings for entry and inspection.
1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Air Duct Accessories" for access panels and doors.
 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
 3. Remove and reinstall ceiling to gain access during the cleaning process.
- C. Particulate Collection and Odor Control:
1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
 2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.
- D. Clean the following components by removing surface contaminants and deposits:
1. Air outlets and inlets (registers, grilles, and diffusers).
 2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
 3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, filters and filter sections, and condensate collectors and drains.

4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.

3.10 START UP

- A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.11 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

1. Lined ductwork: coordinate locations of ductwork requiring liner and thickness of liner with the contract drawings. Provide double wall with perforated liner when indicated on contract drawings.
2. Exposed ductwork in occupied areas: round or flat oval. Coordinate locations of exposed ductwork in occupied areas with the contract drawings.
3. Kitchen and dishwasher exhaust ductwork shall be stainless steel.

System	Pressure Classification	Seal Class	Rectangular Leakage Class	Round Leakage Class
Supply and return	4"	A	6	3
Dedicated exhaust systems (e.g. toilet, general, smoke purge)	3"	B	12	6
Outdoor air and exhaust air	3"	A	6	3

- B. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.
2. Stainless-Steel Ducts:

- a. Exposed to Airstream: Match duct material.
 - b. Not Exposed to Airstream: Match duct material.
3. Aluminum Ducts: Aluminum.
- C. Elbow Configuration:
1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."
 - a. Velocity 1000 fpm or Lower:
 - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
 - 2) Mitered Type RE 4 without vanes.
 - b. Velocity 1000 to 1500 fpm:
 - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."
 - c. Velocity 1500 fpm or Higher:
 - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."
 2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."
 - a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."
 3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."
 - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
 - 2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
 - 3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.

4) Radius-to Diameter Ratio: 1.5.

- b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
- c. Round Elbows, 14 Inches and Larger in Diameter: Welded.

D. Branch Configuration:

- 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Spin in.
- 2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity 1000 fpm or Lower: 90-degree tap.
 - b. Velocity 1000 to 1500 fpm: Conical tap.
 - c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 23 31 13

SECTION 23 33 00 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 230500 shall also govern work specified together with all applicable paragraphs of other Division 23 sections.

1.2 SUMMARY

A. Section Includes:

- 1. Backdraft and pressure relief dampers.
- 2. Barometric relief dampers.
- 3. Manual volume dampers.
- 4. Control dampers.
- 5. Fire dampers.
- 6. Ceiling dampers.
- 7. Combination fire and smoke dampers.
- 8. Flange connectors.
- 9. Duct silencers.
- 10. Turning vanes.
- 11. Remote damper operators.
- 12. Duct-mounted access doors.
- 13. Flexible connectors.
- 14. Flexible ducts.
- 15. Duct accessory hardware.

B. Related Sections:

- 1. Division 28 Section "Fire Detection and Alarm" for duct-mounted fire and smoke detectors.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

- 1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details, product data and attachments to other work, include with ductwork shop drawings

- 1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

- a. Special fittings.
- b. Manual volume damper installations.

- c. Concealed volume damper operators, with locations shown on the ductwork shop drawings, and details/method of installation to finished surfaces.
- d. Control damper installations.
- e. Fire-damper, smoke-damper, combination fire- and smoke-damper, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors and remote damper operators. Include installation details for angles, sleeves, breakaway connections, out-of-wall installations, and factory insulation.
- f. Duct security bars.
- g. Wiring Diagrams: For power, signal, and control wiring.
- h. Duct access doors
- i. Duct test holes
- j. Duct Silencers:
 - 1) Submit shop drawings and product data under provisions of this Division and DDC General Conditions as applicable.
 - 2) Shop Drawings: Indicate assembly, materials, thicknesses, dimensional data, pressure losses, acoustical performance, layout, and connection details.
 - 3) Product Data: Provide catalog information indicating, materials, dimensional data, pressure losses, acoustical performance and conformance with Reference Standards applicable.
 - 4) Test Reports: Indicate dynamic insertion loss and noise generation values of silencers meet or exceed specified sound transmission loss values. Do not exceed static pressure drops indicated in the equipment schedules.
 - 5) Manufacturers Installation Instructions: Indicate Installation requirements which maintain integrity of sound isolation.
 - 6) Manufacturers Field Reports: Submit under provisions of General Conditions and DDC General Conditions as applicable. Indicate installation is complete and in accordance with instructions.
 - 7) Submittals and Report: Definitions conform to ANSI S1.1.
 - 8) Schedule of acoustic lining, showing type, thickness and location.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.

D. Source quality-control reports.

E. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

F. Manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

A. Reference Standards:

- 1. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
- 2. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems.
- 3. SMACNA - Low Pressure Duct Construction Standards.
- 4. UL 33 - Heat Responsive Links for Fire-Protection Service.
- 5. UL 555 and UL 555S- Fire Dampers and Smoke Dampers.
- 6. ADC 1062 - Certification, Rating and test Manual.
- 7. AMCA 500- Test Method for Louvers, Dampers and Shutters.
- 8. ARI 650 - Air Outlets and Inlets.

9. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.
 10. AMCA 300 - Test Code for Sound Rating.
 11. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
 12. AMCA 302 - Application of Sound Loudness Ratings for Non-Ducted Air Moving Devices.
 13. AMCA 303 - Application of Sound Power Level Ratings for Ducted Air Moving Devices Recommended Typical dBa Calculation.
 14. ANSI S1.1 - Acoustical Terminology (Including Mechanical Shock and Vibration).
 15. ANSI S1.8 - Preferred Reference Quantities for Acoustical Levels.
 16. ANSI S1.13 - Methods for Measurement of Sound Pressure Levels.
 17. ARI 575 - Measuring Machinery Sound Within Equipment Rooms.
 18. ASA 16 (ANSI S1.36) - Survey Methods for Determination of Sound Power Levels of Noise Sources.
 19. ASA 47 (ANSI S1.4) - Specification for Sound Level Meters.
 20. ASA 49 (ANSI S12.1) - Preparation of Standard Procedures to Determine the Noise Emission from Sources.
 21. ASHRAE 68 - Method of Testing In-Duct Sound Power Measurement Procedure for Fans.
 22. ASHRAE Handbook - Systems Volume, Chapter "Sound and Vibration Control".
 23. ASTM E90 - Method for Laboratory Measurement of Airborne Sound Transmission of Building Partition.
 24. ASTM E477 - Method of Testing Duct Liner Materials and Prefabricated Silencers for Acoustical and Airflow Performance.
 25. ASTM E596 - Method for Laboratory Measurement of the Noise Reduction of Sound Isolating Enclosures.
 26. NEBB - Procedural Standards for Measuring Sound and Vibration.
- B. Comply with AMCA 500-D testing for damper rating.

1.5 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.
 2. Special tools for concealed volume damper operator: one per floor.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
1. Galvanized Coating Designation: G60 (Z180).
 2. Exposed-Surface Finish: Mill phosphatized.
- C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and finish to be specified by architect for exposed ducts.

- D. Aluminum Sheets: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- E. Extruded Aluminum: Comply with ASTM B 221 (ASTM B 221M), Alloy 6063, Temper T6.
- F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ruskin Company.
 - 2. Air Balance Inc.; a division of Mestek, Inc.
 - 3. American Warming and Ventilating; a division of Mestek, Inc.
 - 4. Duro Dyne Inc.
 - 5. Greenheck Fan Corporation.
- B. Description: Adjustable gravity balanced.
- C. Maximum Air Velocity: 3000 fpm.
- D. Maximum System Pressure: 2-inch wg .
- E. Frame: 0.052-inch-thick, galvanized sheet steel or 0.063-inch-thick extruded aluminum, with welded corners and mounting flange.
- F. Blades: Multiple single-piece blades, center-pivoted, maximum 6-inchwidth, 16 gauge galvanized steel or extruded aluminum, with sealed edges.
- G. Blade Action: Parallel.
- H. Blade Seals: Felt or Vinyl foam.
- I. Blade Axles:
 - 1. Material: Plated steel.
 - 2. Diameter: 0.20 inch.
- J. Tie Bars and Brackets: Aluminum or Galvanized steel per the blade construction.
- K. Return Spring: Adjustable tension.
- L. Bearings: Steel ball.
- M. Accessories:
 - 1. Adjustment device to permit setting for varying differential static pressure.
 - 2. Counterweights and spring-assist kits for vertical airflow installations.
 - 3. Electric actuators.

4. Chain pulls.
5. Screen Mounting: Front mounted in sleeve.
 - a. Sleeve Thickness: 20-gage minimum.
 - b. Sleeve Length: 6 inches minimum.
6. Screen Mounting: Rear mounted.
7. Screen Material: Galvanized steel or Aluminum.
8. Screen Type: Bird.
9. 90-degree stops.

2.3 BAROMETRIC RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Air Balance Inc.; a division of Mestek, Inc.
 2. American Warming and Ventilating; a division of Mestek, Inc.
 3. Duro Dyne Inc.
 4. Greenheck Fan Corporation.
- B. Suitable for horizontal or vertical mounting.
- C. Maximum Air Velocity: 2000 fpm.
- D. Maximum System Pressure: 4-inch wg.
- E. Frame: 0.064-inch-thick, galvanized sheet steel welded corners and mounting flange.
- F. Blades:
 1. Multiple, 0.050-inch-thick aluminum sheet.
 2. Maximum Width: 6 inches.
 3. Action: Parallel.
 4. Balance: Gravity.
 5. Eccentrically pivoted.
- G. Blade Seals: Neoprene.
- H. Blade Axles: Galvanized steel.
- I. Tie Bars and Brackets:
 1. Material: Galvanized steel.
 2. Rattle free with 90-degree stop.
- J. Return Spring: Adjustable tension.
- K. Bearings: Stainless steel.
- L. Accessories:
 1. Flange on intake.
 2. Adjustment device to permit setting for varying differential static pressures.

2.4 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ruskin Company.
 - b. Air Balance Inc.; a division of Mestek, Inc.
 - c. American Warming and Ventilating; a division of Mestek, Inc.
2. Standard leakage rating with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames:
 - a. Hat-shaped, galvanized-steel channels, 16 gauge minimum thickness.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
 - d. Dampers less than 12": 4½ inches wide.
 - e. Dampers 12" and larger: minimum 5 inches wide.
5. Blades:
 - a. Dampers less than 12 inches: single blade.
 - b. Dampers 12 inches and greater: Opposed-blade design, 8 inches wide.
 - c. Stiffen damper blades for stability.
 - d. Galvanized-steel, 16 gauge.
6. Blade Axles: ½ inch minimum steel, extending 6 inches beyond frame. ½ inch jackshaft for multisection dampers for single-sided actuation.
7. Bearings:
 - a. Molded synthetic, 48 inches maximum spacing.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less and greater than 18 inches shall have axles full length of damper blades and bearings at both ends of operating shaft.
8. Tie Bars and Brackets: Galvanized steel.

B. Standard, Aluminum, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ruskin Company.
 - b. Air Balance Inc.; a division of Mestek, Inc.
 - c. American Warming and Ventilating; a division of Mestek, Inc.
2. Standard leakage rating.
3. Suitable for horizontal or vertical applications.
4. Frames: Hat-shaped, 0.10-inch-thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:

- a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Roll-Formed Aluminum Blades: 0.10-inch-thick aluminum sheet.
 - e. Extruded-Aluminum Blades: 0.050-inch-thick extruded aluminum.
6. Blade Axles: Nonferrous metal.
7. Bearings:
- a. Molded synthetic.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
8. Tie Bars and Brackets: Aluminum.

2.5 CONTROL AND ISOLATION DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ruskin Company.
 2. Greenheck Fan Corporation.
 3. American Warming and Ventilating; a division of Mestek, Inc.
- B. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage. Less than 10cfm/sqft at 4 inches WG.
1. When used as an isolation damper in an intake or relief/ exhaust application, damper leakage must be less than 3 cfm/sqft at 4 inches WG
- C. Frames:
1. Hat shaped.
 2. Galvanized-steel channels, 16 gauge.
 3. Mitered and welded corners.
 4. Flanges for attaching to walls and flangeless frames for installing in ducts.
 5. Dampers less than 12 inches: 4½ inches wide.
 6. Dampers 12 inches and larger: minimum 5 inches wide.
 7. Stainless steel jamb seals.
- D. Blades:
1. Multiple blade with maximum blade width of 6 inches.
 2. Opposed-blade design.
 3. Galvanized steel.
 4. 16 gauge.
 5. Blade Edging: PVC.
- E. Blade Axles: 1/2-inch-diameter; plated steel extending minimum 6 inches beyond frame; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings. ½ inch jackshaft for multisection dampers for single-sided actuation.
1. Operating Temperature Range: From minus 25 to plus 180 deg F.
- F. Bearings:

1. Molded synthetic.
2. Dampers in ducts with pressure classes of 3-inch wg or less and greater than 18 inches shall have axles full length of damper blades and bearings at both ends of operating shaft.
3. Thrust bearings at each end of every blade.

2.6 DAMPER REGULATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following complete with dial regulator, square end bearing, and spring end bearing for accessible damper locations:

1. Ventfabrics, Inc.
2. Young Regulator Co.

- B. Shaft length 12 inches or less:

1. ¼ inch dial regulator.
2. Die cast steel with heavy gauge dial.
3. 3/32 inch steel handle.
4. ¾ inch hexagonal nut.
5. All steel components zinc plated.
6. Provide elevated dial or shaft extension for use on insulated ducts.

- C. Shaft length greater than 12 inches and less than 20 inches:

1. 3/8 inch dial regulator.
2. Die cast steel with heavy gauge dial.
3. 3/32 inch steel handle.
4. ¾ inch hexagonal nut.
5. All steel components zinc plated.
6. Provide elevated dial or shaft extension for use on insulated ducts.

- D. Shaft length 20 inches or greater:

1. Die-cast steel.
2. Self-locking regulator with locking nut.
3. Heavy steel stamped handle.
4. Serrated teeth to prevent slippage with flat spring between the two pieces.
5. Gasket.
6. Provide elevated dial or shaft extension for use on insulated ducts.

2.7 FIRE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ruskin Company.
2. Greenheck Fan Corporation.
3. Air Balance Inc.; a division of Mestek, Inc.

- B. Type: Dynamic; rated and labeled according to UL 555 by an NRTL.

- C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.

- D. Fire Rating: 1-1/2 hours in a 2 hour wall, ½ hour in a 1 hour wall.
- E. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch-thick galvanized steel; with mitered and interlocking corners.
- F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
 - 1. Minimum Thickness: 0.052 or 0.138 inch thick, as indicated, and of length to suit application.
 - 2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.
- G. Mounting Orientation: Vertical or horizontal as indicated.
- H. Blades: Roll-formed, interlocking, 0.034-inch-thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch-thick, galvanized-steel blade connectors.
- I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
- J. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

2.8 CEILING DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ruskin Company.
 - 2. Greenheck Fan Corporation.
 - 3. Air Balance Inc.; a division of Mestek, Inc.
- B. General Requirements:
 - 1. Labeled according to UL 555C by an NRTL.
 - 2. Comply with construction details for tested floor- and roof-ceiling assemblies as indicated in UL's "Fire Resistance Directory."
- C. Frame: Galvanized sheet steel, round or rectangular, style to suit ceiling construction. 3 inch 20 gauge minimum for rectangular, 3-1/2 inch 20 gauge minimum for circular galvanized steel with roll formed ridge for blade stop.
- D. Blades: Galvanized sheet steel with refractory insulation.
 - 1. Style: Two-piece, single-thickness with blade insulation, hinged in center, and held open with fusible link.
 - 2. Action: Butterfly.
 - 3. Orientation: Horizontal.
 - 4. Material: Minimum 20 gage galvanized steel.
- E. Heat-Responsive Device: Replaceable, 212 deg F rated, fusible links.
- F. Fire Rating: 3 hours.
- G. Thermal Insulation Blanket: Mineral wool.

- H. Hinge: Spring stainless steel, mechanically attached to blades.
- I. Mounting: Horizontal.
- J. Finish: Mill galvanized.
- K. Assembly: Factory-assembled damper and accessories and furnish as a single unit conforming to UL 555C.
- L. Dampers shall be suitable for use in dynamic systems. Classified for dynamic closure to a minimum of 2000fpm and 4 inches wg differential pressure for air flow direction as installed.

2.9 COMBINATION FIRE AND SMOKE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ruskin Company.
 - 2. Greenheck Fan Corporation.
 - 3. Air Balance Inc.; a division of Mestek, Inc.
- B. Type: Dynamic; rated and labeled according to UL 555 and UL 555S by an NRTL.
- C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.
- D. Fire Rating: 1-1/2 hours for 2 hour walls, 3 hours for 3 hour walls.
- E. Frame: 5 inches 16 gauge hat shaped channel; fabricated with roll-formed, 0.034-inch-thick galvanized steel; with mitered and interlocking corners, structurally equivalent to 13 gauge U-channel type frame.
- F. Heat-Responsive Device: Electric resettable link and switch package, factory installed, rated.
- G. Smoke Detector: Integral, factory wired for single-point connection, refer to accessories below.
- H. Blades: Opposed blade; true airflow shaped, single piece, double skin; minimum 14 gauge; maximum 6 inch width.
- I. Bearings: Stainless steel sleeve pressed into frame.
- J. Seals:
 - 1. Blades: inflatable silicone fiberglass material to maintain smoke leakage rating to a minimum of 450 degrees F and blade edge overlap for flame seal to 1900 degrees F; glue-on or grip type seals are not acceptable.
 - 2. Jamb: stainless steel flexible metal compression type.
- K. Linkage concealed in frame.
- L. Minimum 1/2 inch plated steel hex stock shaft mechanically attached to blade.
- M. Mounting: vertical or horizontal.
- N. Leakage: Class I, (less than 8cfm at 4 inch wg differential pressure).

- O. Rated pressure and velocity to exceed design airflow conditions.
- P. Mounting Sleeve: Factory-installed, 20 gauge, galvanized sheet steel; length to suit wall or floor application, minimum 17 inches with factory-furnished silicone calking to comply with leakage rating requirements.
- Q. Breakaway Connections
 - 1. Provide breakaway connections are required on all installations unless the damper sleeve is at least 16 gauge galvanized steel.
- R. Master control panel for use in dynamic smoke-management systems.
- S. Damper Motors: Two-position action.
- T. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 - 2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 23 Section "Instrumentation and Control for HVAC" and Division 26 Sections.
 - 3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
 - 4. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf and breakaway torque rating of 150 in. x lbf.
 - 5. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F.
 - 6. Nonspring-Return Motors: For dampers larger than 25 sq. ft., size motor for running torque rating of 150 in. x lbf and breakaway torque rating of 300 in. x lbf.
 - 7. Electrical Connection: 115 V, single phase, 60 Hz.
- U. Temperature Release Device: Heat-Actuated, Quick Detect.
 - 1. Close (in a controlled manner) and lock damper during test, smoke detection, power failure, or fire conditions through actuator closure spring. At no time shall actuator disengage from damper blades.
 - 2. Allow damper to be automatically and remotely reset after test or power failure conditions. After exposure to high temperature or fire, inspect damper before reset to ensure proper operation.
 - 3. Controlled closing and clocking of damper in 7 - 15 seconds to allow duct pressure to equalize. Instantaneous closure is not acceptable.
 - 4. Release Temperature: 165 degrees F.
- V. Actuator: Actuator shall be selected such that the combined actuator/damper assembly is UL listed, and approved by the AHJ.
 - 1. Type: coordinate with Section 230900 (Facility Management System) for two-position versus modulating.

- a. Electric 120V, 60 Hz, two-position, fail close.
 - b. Electric 120V, 60 Hz, modulating, fail close (FSD60 only).
2. Mounting: as required for access.
- a. External.
 - b. Internal
- W. Finish - Mill galvanized.
- X. Accessories:
1. TS150 EZ Fire Stat: (Ruskin, or equivalent by other manufacturers factory installed):
 - a. UL classified controlling device to allow dampers to be reopened after the initial closure as part of a smoke purge system.
 - b. At temperatures in excess of 165 degrees F, the damper will close and lock into position.
 - c. The damper shall remain closed until the override signaled from a remote command station is present and the duct temperature is not above the high limit specified below.
 - d. A high limit temperature sensor shall prevent the damper from being opened if the duct temperature is above 350 degrees F.
 - e. Device shall also include a manual reset button for local opening of damper.
 - f. Position indicating switches are not required.

2.10 FLANGE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ductmate Industries, Inc.
 2. Nexus PDQ; Division of Shilco Holdings Inc.
 3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Description: roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
- C. Material: Galvanized steel.
- D. Gage and Shape: Match connecting ductwork.

2.11 DUCT SILENCERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Industrial Acoustics Company (IAC) Americas, Inc.
 2. Vibro-Acoustics.
 3. Innovative Metal Industries, Inc.
- B. General Requirements:
1. Factory fabricated.

2. Fire-Performance Characteristics: Adhesives, sealants, packing materials, and accessory materials shall have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested according to ASTM E 84.
 3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.
 4. Performance:
 - a. The dynamic insertion loss in dB for silencers shall not be less than that shown on the Duct Silencer Schedule, or Drawings, at the face air velocity of +1,000 fpm (+ indicates airflow in the same direction as attenuation).
 - b. Duct silencers shall not produce self-noise power levels in dB re 10^{-12} watts that exceed those shown on the Duct Silencer Schedule.
 - c. Duct silencers static pressure drop shall not exceed those indicated on the duct silencer schedule for the scheduled airflow velocity and location shown.
- C. Shape:
1. Rectangular straight with lined splitters with radiused nose and contoured tails
 2. Round straight with lined splitters with radiused nose and contoured tails.
- D. Rectangular Silencer Outer Casing: ASTM A 653/A 653M, G60 (Z180), galvanized sheet steel, 22 gauge.
- E. Round Silencer Outer Casing: ASTM A 653/A 653M, G60 (Z180), galvanized sheet steel.
1. Sheet Metal Thickness for Units up to 22 Inches in Diameter: 22 gauge
 2. Sheet Metal Thickness for Units greater than 22 inches in Diameter: 18 gauge.
- F. Inner Casing and Baffles: ASTM A 653/A 653M, G60 (Z180) galvanized sheet metal, 0.034 inch thick, and with 1/8-inch-diameter perforations.
- G. Connection Sizes: Transition connecting ductwork to scheduled attenuator size with maximum 30deg. walls unless otherwise indicated.
- H. Principal Sound-Absorbing Mechanism:
1. Duct silencers shall have baffles filled with inorganic mineral or glass fiber sound-absorptive material packed under minimum 5 percent compression.
 2. Controlled impedance membranes and broadly tuned resonators without absorptive media.
 3. Film-lined type with fill material.
 - a. Fill Material: Inert and vermin-proof moisture-proof mineral glass fiber material, packed under not less than 5 percent compression to eliminate voids with a density in excess of 4lb/cu. ft..
 - b. Erosion Barrier: Polymer bag enclosing fill, and heat sealed before assembly.
 4. Lining: Tedlar film, with wrapped media separated from perforated metal by factory installed acoustically transparent, flame retardant, erosion resistant spacer.
- I. Fabricate silencers to form rigid units that will not pulsate, vibrate, rattle, or otherwise react to system pressure variations. Do not use mechanical fasteners for unit assemblies.
1. Lock form and seal .

2. Suspended Units: Factory-installed suspension hooks or lugs attached to frame in quantities and spaced to prevent deflection or distortion.
3. Reinforcement: Cross or trapeze angles for rigid suspension.
4. Perforated metal shall be adequately stiffened to ensure flatness and form with painted spot welds.

J. Accessories:

1. Integral 1-1/2 or 3-hour fire damper to match wall rating with access door. Access door to be high transmission loss to match silencer if provided.
2. Factory-installed end caps to prevent contamination during shipping.
3. Removable splitters.
4. Airflow measuring devices.

K. Source Quality Control: Test according to ASTM E 477.

1. Record installed acoustic performance, including dynamic insertion loss and generated-noise power levels with a forward flow and reverse flow for air velocities representative of the installation.
2. Leak Test: Test units for airtightness at 200 percent of associated fan static pressure or 8-inch wg (2000-Pa) static pressure, whichever is greater.
3. Static pressure loss of the attenuators at the operating airflow, shall not exceed the values listed in the silencer schedules. Airflow measurements shall be made in accordance with ASTM E477 and applicable airflow codes.

L. Identification

1. Indelibly mark attenuators with manufacturer's name, product designation, project and unit reference numbers.

2.12 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. METALAIRE, Inc.
4. SEMCO Incorporated.
5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."

E. Vane Construction:

1. Single wall
 - a. For use with lower than 3 inch wg pressure classification system, except as noted.
 - b. ¾ inch trailing edge and 2 inch radius.
 - c. Type Y blades for ducts 36 inches or less in width.
 - d. Type Z blades for ducts greater than 36 inches in width.
2. Double wall
 - a. For use with 3 inch wg (750Pa) and higher pressure classification systems.
 - b. Small double thickness vanes with 2 inch inside radius.
3. Vane length not to exceed 36 inches. Provide separate equal size section for greater lengths.

2.13 REMOTE DAMPER OPERATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 1. Young Regulator Company.
- B. Description: Cable system designed for remote manual damper adjustment. Provide controller package for a complete workable system for damper operation, including (but not limited to): gear drives and controller, mounting brackets, connecting operator wire and casing, and wrenches.
- C. Cable: Stainless steel, 50ft maximum.
- D. Wall-Box Mounting: Recessed,.
- E. Wall-Box Cover-Plate: Zinc plated, for use with flush ceiling/wall installation, not exceeding 7/8 inch in diameter.

2.14 DUCT-MOUNTED ACCESS DOORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Ventfabrics, Inc.
 2. Greenheck Fan Corporation.
 3. American Warming and Ventilating; a division of Mestek, Inc.
- B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."
 1. Door:
 - a. Double wall, rectangular, minimum 18 inch x 18 inch, or as indicated.
 - b. Galvanized sheet metal fabricated of the same material, finish and gauge as the ductwork (minimum 20 gauge).
 - c. Vision panel if indicated
 - d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
 - e. Fabricate doors airtight and suitable for duct pressure class.

- f. Design lock edge of doors with a bevel of 1/8-inch in 1 inch and fill interior hollow space with insulation, thermally equivalent to the ductwork insulation. Lap inner face of door over duct opening, a minimum of 1/4-inch on all four edges of the free duct opening.
 - g. Frame duct opening for each door with a continuous 1 inch by 1 inch by 12 gauge sheet metal angle, of the same material as the duct in which installed, riveted to the exterior surface of the duct opening.
2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
 3. Number of Hinges and Locks:
 - a. Access Doors up to 18 Inches Square: Two hinges and two sash locks, with inside striker for contacting inside of door framing to provide a compression fit.
 - b. Access Doors 24 inches and greater: Three hinges and two compression latches.
 4. Butt hinges: Provide galvanized steel with brass pins, approximately 2 inches by 1-1/2 inches wide for doors under 24 inches high; hinges 3 inches by 2 inches wide for doors 24 inches higher and greater.
 5. Casement fasteners: Steel or cast aluminum with a galvanized or aluminized finish.
 6. Door latches: operable rustproof zinc/aluminum alloy latch accessible from inside and outside duct. Steel and sponge rubber washers to prevent leakage. Beveled flange to work against frame to achieve compression.

2.15 DUCT ACCESS PANEL ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Ductmate Industries, Inc.
 2. Flame Gard, Inc.
 3. 3M.
- B. Labeled according to UL 1978 by an NRTL.
- C. Panel and Frame: Minimum thickness 0.0428-inch stainless steel.
- D. Fasteners: Stainless steel. Panel fasteners shall not penetrate duct wall.
- E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.
- F. Minimum Pressure Rating: 10-inch wg, positive or negative.

2.16 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Duro Dyne Inc.
 2. Ventfabrics, Inc.
 3. Ductmate Industries, Inc.
- B. Materials: Flame-retardant or noncombustible fabrics, in compliance with ASTM E84.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.

- D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-inches wide attached to 2 strips of 3-inch-wide, 16 gauge, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.
- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
1. Minimum Weight: 26 oz./sq. yd.
 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 3. Service Temperature: Minus 40 to plus 200 deg F.
- F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
1. Minimum Weight: 24 oz./sq. yd.
 2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
 3. Service Temperature: Minus 50 to plus 250 deg F.
- G. High-Temperature System, Flexible Connectors: Glass fabric coated with silicone rubber.
1. Minimum Weight: 16 oz./sq. yd.
 2. Tensile Strength: 285 lbf/inch in the warp and 185 lbf/inch in the filling.
 3. Service Temperature: Minus 67 to plus 500 deg F.
- H. High-Corrosive-Environment System, Flexible Connectors: Glass fabric with chemical-resistant coating.
1. Minimum Weight: 14 oz./sq. yd..
 2. Tensile Strength: 450 lbf/inch in the warp and 340 lbf/inch in the filling.
 3. Service Temperature: Minus 67 to plus 500 deg F.
- I. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.
1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
 2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
 7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.
- J. Connector construction shall be such to resist static pressure of ductwork systems as specified in 233113 (ductwork) or as shown on the drawings.

2.17 FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Thermaflex MKE
 2. Cody Company, Inc.
 3. Flexmaster U.S.A., Inc.
 4. McGill AirFlow LLC.
 5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Noninsulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire.
1. Pressure Rating: 10-inch wg positive and 1-inch wg negative.
 2. Maximum Air Velocity: 5000 fpm.
 3. Temperature Range: Minus 20 to plus 200 deg F.
- C. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; metallized polyester vapor-barrier film. Provide 100% separation of airstream and fiberglass through non-perforated core. Individual lengths with factory fabricated steel compression clamp connection collars at both ends.
1. Pressure Rating: 10-inch wg positive and 0.5-inch wg negative.
 2. Maximum Air Velocity: 5000 fpm.
 3. Temperature Range: Minus 20 to plus 200 deg F.
 4. Water Vapor Permeance: 0.17 grains per sq. ft. per hour per inch of Hg. (Test Method: ASTM E 96, Procedure A)
 5. Insulation R-Value: R-4.2 minimum at 75 deg F.
 6. Insulation is required for supply duct systems.
- D. Flexible ductwork shall be a maximum length of three feet to air outlets, two feet to terminal boxes. Only one elbow shall be made per length of flexible duct. Maximum angle of elbow to be limited to 90°. Elbow shall have a minimum throat radius equal to one diameter.
- E. Flexible Duct Connectors:
1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.
 2. Non-Clamp Connectors: Liquid adhesive plus tape.
- F. Regenerative Noise:
1. Noise due to air turbulence within the duct shall not exceed the following sound power levels for a 12-inch diameter duct with an air speed of 1,000 feet per minute.

Octave band center frequency (Hz)	125	250	500	1000	2000
Sound power levels (dB) referenced to 10-12 watts	30	31	30	22	20

2.18 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness. Permanent test holes shall be factory fabricated, air tight flanged fittings with screw cap. Provided extended neck fitting to clear insulation as required.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

- C. Blanking Plate: 16 gauge galvanized sheet metal, painted matt black cut to size as required.
- D. Blanking Panel: Construct from 18 gauge galvanized sheet metal sandwich with 1 inch thick, 1 1/2 lb cu. ft density rigid board fiberglass insulation. Attach insulation to metal with adhesive fasteners and edge tape. Overlap front and back metal plates and tack weld at 3 inch centers.
- E. Perforated Plate: Construct from 16 gauge galvanized steel with circular holes equally distributed and equally sized to achieve the free area required. Galvanized after perforating.
- F. Flashing: 16 gage ducts through roof, galvanized steel, flashed and counterflashed, and provided with storm collars to secure watertight construction.
- G. Bird Screens: 14 gauge, 1/2-inch galvanized wire mesh set in galvanized steel frame.
- H. Drip Pans: 18 gauge, galvanized sheet metal 2 inches deep, solder-jointed, with drain piped to nearest air gap waste, unless specifically shown otherwise. Extend coil drip pans under coil valving.
- I. Equalizing Grid: 3 inch thick aluminum honeycomb grid with 3/8-inch openings securely fastened inside a 16 gauge galvanized steel duct section 6 inches long. Grid and casing in outside air intake duct shall be 304 stainless steel.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install backdraft or control dampers at outlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 - 1. Install steel volume dampers in steel ducts.
 - 2. Install aluminum volume dampers in aluminum ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Provide concealed remote volume damper operators for all volume dampers in inaccessible locations. Operator shall be installed within the ceiling or wall such that the unit is flush with the finished surface. Operators for diffusers shall not be located in active supply portions of the diffuser, but may be installed in blank-off locations and/or return diffusers. Coordinate location of operator with the Commissioner.

- G. Install test holes at fan inlets and outlets, and as required for testing and balancing, and elsewhere as indicated.
- H. Install fire, smoke, and combination fire and smoke dampers according to UL listing.
- I. Demonstrate resetting of fire dampers / fire & smoke dampers to the AHJ.
- J. Provide fire and smoke dampers, fire dampers at locations where ducts and outlets pass through fire rated components. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges. Install all dampers in accordance with SMACNA fire damper guide and manufacturer's instructions.
- K. Connect ducts to duct silencers with flexible duct connectors.
- L. Install duct silencers in accordance with manufacturer's instructions.
- M. Support duct silencers independent of ductwork.
- N. All attenuators shall be installed in locations as shown on the drawings. All ductwork between air handling unit and the attenuators including the plenum shall be of double skin construction.
- O. All attenuators shall provide minimum dynamic insertion loss and maximum static pressure drop performance which is no less than the basis of design make and model as provided in the contract document mechanical equipment schedules.
- P. All attenuators downstream of elbows shall be oriented with the internal baffles parallel to the plane of the elbow.
- Q. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 - 1. On both sides of duct coils and humidifiers.
 - 2. Upstream and downstream from duct filters.
 - 3. At outdoor-air intakes and mixed-air plenums.
 - 4. At drain pans and seals.
 - 5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
 - 6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
 - 7. At each change in direction and at maximum 50-foot spacing.
 - 8. Upstream from turning vanes.
 - 9. Upstream or downstream from duct silencers.
 - 10. Control devices requiring inspection.
 - 11. Elsewhere as indicated.
- R. Install access doors with swing against duct static pressure.
- S. Access Door Sizes:
 - 1. Two-Hand Access: 12 by 12 inches.
 - 2. Head and Shoulders Access: 18 by 18 inches.

3. Body Access: 25 by 14 inches.
 4. Body plus Ladder Access: 25 by 17 inches.
- T. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- U. On doors of systems where fan is scheduled for 4 inches static pressure or greater, provide painted signs appropriately worded as follows:
1. CAUTION – DOOR CLOSSES WITH AIR PRESSURE
 2. CAUTION – DOOR OPENS WITH AIR PRESSURE
- V. Install flexible connectors to connect ducts to motorized equipment.
1. Connectors shall not be less than 6 inches long or more than 10 inches long.
- W. Provide ductwork connected to air-handling equipment or air inlet and outlet devices, with all necessary transformation pieces, flexible fabric connections, as required.
1. For round duct connection, install fabric connectors a minimum of 3 inches in length for ducts having a maximum diameter of 18 inches and a minimum of 5 inches in length for duct diameters over 18 inches in size.
 2. Secure fabric connectors tightly to fans, casings and ducts as follows:
 - a. Secure round connectors with 12 gauge by 1 inch wide galvanized steel draw bands. Secure bands with bolts and nuts.
 - b. Secure rectangular connectors with 1 inch by 1/8-inch thick flat galvanized steel bars, with screws or bolts on 8 inch centers maximum, or with sheet metal slip joints. Tightly crimp fabric into sheet metal joint and secure complete joint with sheet metal screws on 6-inch centers maximum.
 3. Allow at least 3 inch slack in connections.
 4. Fabric connectors may be factory pre-fabricated pre-assembled units, with minimum 24 gauge metal edges, secured to fabric with double lock seams.
 5. Do not paint fabric connectors.
 6. Install also in ducts at structural expansion joints.
- X. For fans developing static pressures of 5-inch and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps. For large fan connections, provide structural angle on flexible connection to match fan angle according to SMACNA figure 2-17.
- Y. Connect terminal units to supply ducts directly. Do not use flexible ducts to change directions.
- Z. Connect diffusers or light troffer boots to ducts with maximum 36-inch lengths of flexible duct clamped or strapped in place.
- AA. Connect flexible ducts to metal ducts with draw bands. Duct collars exceeding 12" dia. Shall have draw bands positioned behind a bead on the metal collar, per SMACNA.
- BB. Install duct test holes where required for testing and balancing purposes.
- CC. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.
- DD. Provide wire mesh screens on all duct openings that do not contain grilles or access panels.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 23 33 00

SECTION 23 34 16 - CENTRIFUGAL HVAC FANS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Backward-inclined centrifugal fans.
 - 2. Square In-line centrifugal fans

1.3 PERFORMANCE REQUIREMENTS

- A. Project Altitude: Base fan performance ratings on actual Project site elevations above sea level.
- B. Operating Limits: Classify according to AMCA 99.
- C. Acoustic Performance: Unit fan sound power levels shall not exceed the maximum allowable levels as stated in the mechanical schedules, at the scheduled design conditions.

1.4 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:
 - 1. Non-generic certified fan performance curves with system specific operating conditions indicated.
 - 2. Provide certified sound power levels in accordance with AMCA 300 (or ASHRAE 68) and AMCA 301 for the HVAC Fans at the scheduled design conditions.
 - 3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
 - 4. Material thickness and finishes, including color charts.
 - 5. Dampers, including housings, linkages, and operators.
 - 6. Accessories.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Wiring Diagrams: Power, signal, and control wiring.
 - 2. Design Calculations: Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.
 - 3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.
- C. Coordination Drawings: Show fan room layout and relationships between components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate and certify field measurements.

- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For centrifugal fans to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.
- C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA 1.
- D. AMCA 99 - Standards Handbook.
- E. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes.
- F. AMCA 300 - Test Code for Sound Rating Air Moving Devices.
- G. AMCA 301 - Method of Calculating Fan Sound Ratings from Laboratory Test Data.
- H. ANSI/ABMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
- I. ANSI/ABMA 11 - Load Ratings and Fatigue Life for Roller Bearings.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations, with protective crating and covering.
- B. Disassemble and reassemble units, as required for moving to the final location, according to manufacturer's written instructions.
- C. Lift and support units with manufacturer's designated lifting or supporting points.
- D. Protect motors, shafts, and bearing from weather and construction dust.

1.7 COORDINATION

- A. Coordinate size and location of structural-steel support members.
- B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.8 WARRANTY

- A. Guaranty from Contractor

1. Contractor's Guaranty Obligation: The Contractor shall promptly repair, replace, restore or rebuild, as the Commissioner may determine, any finished Work in which defects of materials or workmanship may appear or to which damage may occur because of such defects, during the one (1) year period subsequent to the date of Substantial Completion (or use and occupancy in accordance with the Contract).
 2. Guaranty Period: The obligation of the Contractor, and its Surety under the Performance Bond, is limited to the period(s) of time specified above.
- B. The manufacturer shall provide the parts warranty for equipment manufactured and all vendor supplied components. The said warranty shall cover replacement of all defective parts for a period of 12 months from substantial completion.
- 1.9 EXTRA MATERIALS
- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Belts: One set for each belt-driven unit.

PART 2 - PRODUCTS

2.1 BACKWARD-INCLINED CENTRIFUGAL FANS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Greenheck.
 2. Loren Cook Company.
- B. Description: Factory-fabricated, -assembled, -tested, and -finished, belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor, drive assembly, and support structure.
1. Where noted, fan shall be UL listed for use as "Power Ventilators for Smoke Control Systems" for 500 deg F (260 deg C) maximum temperature for a minimum of 4 hours of operation.
 2. Fans shall be capable of accommodating static pressure variations of $\pm 10\%$.
 3. Statically and dynamically balance fans to eliminate vibration or noise transmission to occupied areas.
- C. Housings: Class 1 continuously welded heavy gauge steel formed panels to make curved-scroll housings with shaped cutoff; with doors to allow access to internal parts and components.
1. Panel Bracing: Steel angle- or channel-iron member supports for mounting and supporting fan scroll, wheel, motor, and accessories.
 2. Horizontally split, bolted-flange housing.
 3. Spun inlet cone with flange.
 4. Outlet flange.
 5. Coatings: 2 mil (minimum) Polyester Urethane, exceeding the ASTM B117 1000 hour salt spray test.
 6. Provide lifting lugs.
- D. Backward-Inclined Wheels: Single-width-single-inlet galvanized steel construction with curved inlet flange, backplate, non-overloading curved backward-inclined blades welded to flange and backplate and fastened to shaft with set screws.

- E. Shafts: Statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.
1. Turned, ground, and polished hot-rolled steel with keyway. Ship with a protective coating of lubricating oil.
 2. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.
- F. Grease-Lubricated Shaft Bearings: Self-aligning, pillow-block-type, ball or roller bearings with adapter mount and two-piece, cast-iron housing.
1. Ball-Bearing Rating Life: ABMA 9, L10 at 200,000 hours.
 2. Roller-Bearing Rating Life: ABMA 1, L50 at 400,000 hours.
 3. Extend lubrication lines to outside of casing and terminate with grease fittings.
- G. Belt Drives: Factory mounted, with final alignment and belt adjustment made after installation.
1. Service Factor Based on Fan Motor Size: 1.5.
 2. Fan Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory with keyway.
 3. Motor Pulleys: Adjustable pitch for use with motors through 15 hp; fixed pitch for use with larger motors, matched belts, and drive rated as recommended by manufacturer or minimum 1.5 times nameplate rating of the motor. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
 4. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
 5. Belt Guards: Fabricate to comply with OSHA and SMACNA requirements of diamond-mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation. Include provisions for adjustment of belt tension, lubrication, and use of tachometer with guard in place.
 6. Motor Mount: Adjustable for belt tensioning.
- H. Accessories:
1. Scroll Access Doors: Shaped to conform to scroll, with quick-opening latches and gaskets.
 2. Cleanout Door: Bolted gasketed door allowing access to fan scroll, of same material as housing.
 3. Scroll Drain Connection: NPS 1 (DN 25) steel pipe coupling welded to low point of fan scroll.
 4. Companion Flanges: Rolled flanges for duct connections of same material as housing.
 5. Fixed Inlet Vanes: Steel construction with fixed cantilevered inlet guide vanes welded to inlet bell.
 6. Inlet Screens: ½ inch (12mm) wire mesh grid screen of same material as housing.
 7. Shaft Cooler: Metal disk between bearings and fan wheel, designed to dissipate heat from shaft.
 8. High Temperature Shaft Seals: Airtight seals installed around shaft on drive side of single-width fans.
 9. Weather Cover: Enameled-steel sheet with ventilation slots; bolted to housing.
 10. Backdraft Dampers: Refer to 233300 "Air Duct Accessories."
- I. Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
1. Enclosure Type: Totally enclosed, fan cooled.

2.2 SQUARE INLINE CENTRIFUGAL FANS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Greenheck.
 2. Loren Cook Company.
- B. Description: Factory-fabricated, -assembled, -tested, and -finished, belt-driven inline centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor, drive assembly, and support structure.
1. Fans shall be capable of accommodating static pressure variations of $\pm 10\%$.
 2. Statically and dynamically balance fans to eliminate vibration or noise transmission to occupied areas.
- C. Housings: Heavy gauge galvanized steel of square design with square duct mounting collars.
1. Access panels: two panels perpendicular to the motor mounting panel shall be provided to allow full access to all interior fan components.
 2. Factory supplied mounting brackets for hung installation.
- D. Backward-Inclined Wheels: Aluminum construction and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced.
- E. Shafts: Statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.
1. Turned, ground, and polished hot-rolled steel with keyway. Ship with a protective coating of lubricating oil.
 2. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.
 3. Ball-Bearing Rating Life: ABMA 9, L10 at 100,000 hours.
- F. Belt Drives: Factory mounted, with final alignment and belt adjustment made after installation.
1. Service Factor Based on Fan Motor Size: 1.5.
 2. Fan Pulleys: Cast iron, and securely attached to the wheel and motor shafts; dynamically balanced at factory with keyway.
 3. Motor Pulleys: Adjustable pitch for use with motors through 15 hp; fixed pitch for use with larger motors, matched belts, and drive rated as recommended by manufacturer or minimum 1.5 times nameplate rating of the motor. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
 4. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
 5. Belt Guards: Fabricate to comply with OSHA and SMACNA requirements of diamond-mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation. Include provisions for adjustment of belt tension, lubrication, and use of tachometer with guard in place.
 6. Motor Mount: Adjustable for belt tensioning.
- G. Accessories:

1. Backdraft Dampers: Refer to 233300 "Air Duct Accessories."
- H. Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 1. Motors and drives shall be mounted out of the airstream, and readily accessible for maintenance.

2.3 SOURCE QUALITY CONTROL

- A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal. Sound power levels for fan inlet, fan discharge, and radiated casing shall be measured at the scheduled design conditions.
- B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."
- C. Fan impeller balancing: balance fan impellers in accordance with AMCA Standard 204-96.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install centrifugal fans level and plumb.
- B. Support floor-mounting units using spring isolators having a static deflection of 2 inch (50 mm). Comply with requirements for vibration isolation devices specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
 1. Secure vibration controls to concrete bases using anchor bolts cast in concrete base.
- C. Install floor-mounting units on concrete bases. Concrete, reinforcement, and formwork requirements are specified in Division 03 Section "Cast-in-Place Concrete."
- D. Install floor-mounting units on concrete bases designed to withstand, without damage to equipment, the seismic force required by authorities having jurisdiction. Concrete, reinforcement, and formwork requirements are specified in Division 03 Section "Cast-in-Place Concrete."
- E. Support suspended units from structure using threaded steel rods and spring hangers having a static deflection of 2 inch (50 mm). Vibration-control devices are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
- F. Install units with clearances for service and maintenance.
- G. Label fans according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."
- H. Do not operate fans for any purpose until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

- I. Install fans as indicated. Install with resilient mountings specified in Section 230548 "Vibration and Seismic Controls for HVAC Equipment" and with flexible electrical leads.
- J. Install flexible connections specified in Section 233300 "Air Duct Accessories" between fan inlet and discharge ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.
- K. Install fan restraining snubbers. Flexible connectors shall not be in tension while running.
- L. Provide sheaves required for final air balance.
- M. Provide safety screen where inlet or outlet is exposed.
- N. Provide backdraft dampers on discharge of exhaust fans, except for fans used in Smoke Control applications.

3.2 CONNECTIONS

- A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Air Duct Accessories."
- B. Install ducts adjacent to fans to allow service and maintenance.
- C. Install line-sized piping from scroll drain connection, with trap with seal equal to 1.5 times specified static pressure, to nearest floor drain.
- D. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- E. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. Verify that shipping, blocking, and bracing are removed.
 - 2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
 - 3. Verify that cleaning and adjusting are complete.
 - 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
 - 5. Adjust belt tension.
 - 6. Adjust damper linkages for proper damper operation.
 - 7. Verify lubrication for bearings and other moving parts.
 - 8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
 - 9. Refer to Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.
 - 10. Remove and replace malfunctioning units and retest as specified above.

- B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
- B. Refer to "Owner's Commissioning Requirements" for additional requirements.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Commissioner's maintenance personnel to adjust, operate, and maintain centrifugal fans. Refer to Division 01 Section "General Commissioning Requirements" for additional requirements.

END OF SECTION 23 34 16

SECTION 23 36 00 – AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and DDC General Conditions, apply to this Section. Where conflicts occur between divisions, the more stringent requirement shall apply.
- B. RELATED SECTIONS
 - 1. Section 23 05 13 – Common Motor Requirements for HVAC Equipment.
 - 2. Section 23 09 00 – Instrumentation and Control for HVAC.
 - 3. Section 23 09 93 – Sequence of Operations.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Single duct variable volume terminal units.

1.3 REFERENCES

- A. American Refrigeration Institute:
 - 1. ARI 410 - Forced-circulation Air-cooling and Air-heating Coils
 - 2. ARI 880 - Air Terminals.
 - 3. ARI 885 - Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets.
- B. National Electrical Manufacturers Association:
 - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- C. National Fire Protection Association:
 - 1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
- D. Underwriters Laboratories Inc.:
 - 1. UL 181 - Factory-Made Air Ducts and Connectors.

1.4 SUBMITTALS

- A. DDC General Conditions and Section 23 05 00 – Common Work Results for HVAC. Where conflicts occur between divisions, the more stringent requirement shall apply.
- B. Product Data: For each type of product indicated, include rated capacities, furnished specialties, sound-power ratings, and accessories.
- C. Shop Drawings: Detail equipment assemblies and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Include a schedule showing unique model designation, room location, model number, size, and accessories furnished.
 - 2. Wiring Diagrams: Power, signal, and control wiring.

- D. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Ceiling suspension assembly members.
 - 2. Method of attaching hangers to building structure.
 - 3. Size and location of initial access modules for acoustical tile.
 - 4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

- E. Operation and Maintenance Data: For air terminal units to include in emergency, operation, and maintenance manuals. In addition to items specified in DDC General Conditions include the following:
 - 1. Instructions for resetting minimum and maximum air volumes.
 - 2. Instructions for adjusting software set points.

1.5 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of units and controls components.

- B. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists. Include directions for resetting constant volume regulators.

1.6 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of air terminal units and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

- C. NFPA Compliance: Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

- D. Test and rate air terminal units performance for air pressure drop, flow performance, and acoustical performance in accordance with ARI 880 and ARI 885. Attach ARI seal to each terminal unit.

- E. Provide factory-test data on leakage.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

- B. Installer: Company specializing in performing Work of this section with minimum three years experience approved by manufacturer.

1.8 PRE-INSTALLATION MEETINGS

- A. Refer to DDC General Conditions for meeting requirements.

- B. Convene minimum one week prior to commencing work of this section.

1.9 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.10 COORDINATION

- A. Refer to DDC General Conditions for coordination requirements.
- B. Coordinate Work with Section 23 09 23 - HVAC Instrumentation and Controls.
- C. Coordinate layout and installation of air terminal units and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.11 WARRANTY

- A. Guaranty From Contractor
 1. Contractor's Guaranty Obligation: The Contractor shall promptly repair, replace, restore or rebuild, as the Commissioner may determine, any finished Work in which defects of materials or workmanship may appear or to which damage may occur because of such defects, during the one (1) year period subsequent to the date of Substantial Completion (or use and occupancy in accordance with the Contract).
 2. Guaranty Period: The obligation of the Contractor, and its Surety under the Performance Bond, is limited to the period(s) of time specified above.
- B. Furnish five year manufacturer warranty for air terminal units.

1.12 EXTRA MATERIALS

- A. Refer to DDC General Conditions for extra materials requirements.
- B. Furnish two additional electric motors of each size of fan powered terminal units.

PART 2 - PRODUCTS

2.1 SINGLE DUCT VARIABLE VOLUME AIR TERMINAL UNITS

- A. Manufacturers: Subject to compliance with requirements and manufacturer's offerings, products that may be incorporated into the Work include, but are not limited to, manufacturers specified. The first manufacturer listed represents the basis of design as scheduled and drawn in the Construction Documents.
 1. Titus.
 2. Anemostat Air Products.
 3. Enviromental Technologies, Inc.
 4. Krueger.
 5. The Trane Co.

- B. Product Description: Variable air volume terminal units for connection to central air systems, with electronic controls as scheduled.
- C. Identification: Furnish each air terminal unit with identification label and airflow indicator. Include unit nominal airflow, maximum factory-set airflow and minimum factory-set airflow and coil type.
- D. Basic Assembly:
1. Casings: Minimum 22 gage galvanized steel.
 2. Lining: Minimum 1 inch thick neoprene or vinyl coated glass fiber insulation, 1.5 lb./cu ft density, meeting NFPA 90A requirements and including edge restraints, and UL 181 erosion requirements. Face lining with Mylar film.
 3. Plenum Air Inlets: Round stub connections for duct attachment.
 4. Plenum Air Outlets: S slip-and-drive connections.
 5. Access: Removable panels for access to dampers and other parts requiring service, adjustment, or maintenance; with airtight gasket.
- E. Basic Unit:
1. Configuration: Air volume damper assembly inside unit casing. Locate control components inside protective metal shroud.
 2. Volume Damper: Construct of heavy gauge galvanized steel with peripheral gasket and self-lubricating bearings; maximum damper leakage: 2 percent of design air flow at 3 inches rated inlet static pressure.
 3. Mount damper operator to position damper as indicated on control specifications.
 4. At an inlet velocity of 2000 fpm, the differential static pressure required to operate any terminal size shall not exceed .10 inches wg for the basic terminal.
 5. The terminals shall incorporate multi-point, center-averaging velocity sensors. A minimum of four measuring ports shall be parallel to the take-off point from the sensor. Sensors with measuring ports in series are not acceptable. The sensor must provide a minimum differential pressure signal of .03 inch wg at inlet velocities of 500 fpm. The sensor shall provide control signal accuracy of +/- 5 percent, with the same size inlet duct at any inlet location.
- F. Attenuation Section: Line attenuation sections with 2 inch thick insulation. Face lining with Mylar film.
- G. Multi Outlet Attenuation Section: With 8 inch diameter collars, each with butterfly balancing damper with lock.
- H. Round Outlet as designated on Drawings: Provide transition piece.
- I. Automatic Damper Operator:
1. Pressure independent control devices and actuators shall be provided by the controls contractor, to be factory installed by the VAV box manufacturer. All controls shall be electric with control and monitoring by the building management system. Each VAV box controller shall be provided with a step-down transformer with on-board disconnect on the line voltage side. Capable of supply torque to achieve full shut off under 4 inch wg external mounting.
- J. Sound Ratings: Not to exceed scheduled NC at maximum flow and 1 inch wg inlet pressure.
- K. Thermostat: Wall-mounted electronic type with appropriate mounting hardware. Refer to Section 23 09 00.
- L. Sequence of Operation: Refer to Section 23 09 93.

2.2 SOURCE QUALITY CONTROL

- A. Identification: Label each air terminal unit with plan number, nominal airflow, maximum and minimum factory-set airflows, coil type, and ARI certification seal.
- B. Verification of Performance: Rate air terminal units according to ARI 880.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Refer to DDC General Conditions.
- B. Verify ductwork is ready for air terminal installation.

3.2 INSTALLATION

- A. Connect to ductwork in accordance with Section 23 31 13.
- B. Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."
- C. Install wall-mounted temperature sensors.
- D. Provide minimum straight length of ductwork at each box in accordance with manufacturer's recommendations.
- E. Install ceiling access doors or locate control components of units above easily removable ceiling components.
- F. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.
- G. Support units individually from structure. Do not support from adjacent ductwork or piping. See Section 23 05 48 for vibration isolation and seismic anchorage requirements.
- H. Support air terminal units connected independently of flexible duct.
- I. Install transition piece to match flexible duct size to inlet or outlet of variable air volume terminal.
- J. Ground units with electric heating coils according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- K. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- L. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.
 - 2. Leak Test: After installation, fill water coils and test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace malfunctioning units and retest as specified above.

3.4 ADJUSTING

- A. Refer to DDC General Conditions for requirements for starting and adjusting.
- B. Reset volume with damper operator attached to assembly allowing flow range modulation from 100 percent of design flow to scheduled minimum flow, with zero as hardware minimum stop for VAV boxes scheduled for "shut off capability" flow.

3.5 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions and do the following:
 - a. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.
 - b. Verify that controls and control enclosure are accessible.
 - c. Verify that control connections are complete.
 - d. Verify that nameplate and identification tag are visible.
 - e. Verify that controls respond to inputs as specified.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train the City of New York's maintenance personnel to adjust, operate, and maintain air terminal units. Refer to DDC General Conditions.

END OF SECTION 23 36 00

SECTION 23 37 13 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Rectangular and square ceiling diffusers.
2. Modular core supply grilles.
3. Linear slot diffusers
4. Linear bar grilles

B. Related Sections:

1. Division 08 Section "Louvers and Vents" for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.
2. Division 23 Section "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples for Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.

C. Samples for Verification: For diffusers, registers, and grilles, in manufacturer's standard sizes to verify color selected.

D. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
5. Duct access panels.

E. Source quality-control reports.

PART 2 - PRODUCTS

2.1 SCHEDULED DIFFUSERS

- A. Provide diffusers as indicated on diffuser schedule. Material to be suitable for location installed (i.e. no steel diffusers in wet/humid areas)

2.2 CEILING DIFFUSERS

- A. Rectangular and Square Ceiling Diffusers :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Titus.
 - b. Anemostat Products; a Mestek company.
 - c. Price.
2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Steel.
4. Finish: Baked enamel, color selected by Architect.
5. Face Size: 24 by 24 inches
6. Face Style: Three cone.
7. Mounting: Compatible with ceiling in which diffuser is installed.
8. Pattern: Adjustable.
9. Dampers: As required by 233300 (air duct accessories).
10. Insulated backpan.

2.3 REGISTERS AND GRILLES

- A. Adjustable Bar Grille/Register:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Titus.
 - b. Anemostat Products; a Mestek company.
 - c. Price.
2. Material: Steel. Aluminum for NMR room.
3. Finish: Baked enamel, color selected by Architect.
4. Face Blade Arrangement: Horizontal spaced 3/4 inch apart.
5. Core Construction: Integral.
6. Rear-Blade Arrangement: Vertical spaced 3/4 inch apart.
7. Frame: 1-1/4 inches wide.
8. Mounting: Countersunk screw.
9. Damper Type: As required by 233300 (air duct accessories).

2.4 LINEAR SLOT DIFFUSERS

- A. Slot Diffusers

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Titus.
 - b. Anemostat Products; a Mestek company.
 - c. Price.
2. Devices shall be specifically designed for variable-air-volume flows.
3. Slot diffusers shall be designed for use in supply, return, and/or exhaust air applications.
4. Material: Aluminum.
5. Finish: Baked Enamel. Color selected by architect.
6. Slot Width: As scheduled
7. Number of Slots: As scheduled
8. Length: As scheduled
9. Border Type: Coordinate with mounting surface (i.e. wall, ceiling, lay-in, drywall, etc.) type and architectural specifications.
10. Accessories: As required by mounting surface type and architectural specifications. End caps, blank offs
11. Dampers: As required by 233300 (air duct accessories).
12. Plenum: Insulated
13. Other Features:
 - a. Painted interior
14. Special Instructions:
 - a. Provide ends and corners as required. Ends shall be butt type, field installed, or mitered picture frame type factory installed, as indicated herein or shown on the drawings. Corners shall be mitered one piece unit.
 - b. Pattern controllers shall be one piece extruded aluminum, 24 inches long maximum, positioned between spring loaded spacers. Pattern controllers shall allow the airstream to be directed flat against the ceiling in either direction or downward as well as allowing throw reduction every two feet along the entire length of the linear slot diffusers. The airstream shall be maintained at the ceiling plane and shall not dump when volume is reduced. Only extruded aluminum pattern controllers are acceptable. Where shown or noted pattern controllers shall be designed to allow the airstream to be jetted into the occupied space and be adjustable to vector the airstream as required.

2.5 LINEAR BAR DIFFUSER

A. General

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Titus.
 - b. Anemostat Products; a Mestek company.
 - c. Price.
2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Aluminum, Stainless Steel as scheduled.
4. Finish: Baked enamel, color selected by Architect
5. Arrangement as noted on schedule

- a. Narrow Core Spacing Arrangement: 1/8-inch-thick blades spaced 1/4 inch apart, zero-degree deflection.
 - b. Wide Core Spacing Arrangement: 1/4-inch-thick blades spaced 1/2-inch apart, zero degree deflection
6. Frame: 3/16 inch wide.
 7. Mounting Frame: As scheduled
 8. Mounting: Spring clip.
 9. Damper Type: As required by 233300 (air duct accessories).
 10. Accessories: Alignment pins, Core clips, Blank-off strips.
 11. Special Instructions
 - a. When used in return air application, provide largest continuous sections possible, provide alignment strips as necessary to achieve uniform appearance.

2.6 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."
- B. Size all overhead diffusers to result in maximum air velocity of 30-50 fpm at a level of 6-feet or less above the floor.
- C. Air terminal devices shall be chosen to achieve a noise rating at least 5 dB less than the stated room noise criterion for the total number of terminal devices in the space.
- D. In the event the installed terminal devices fails to meet the specified room noise criterion, the Contractor shall carry out remedial works or provide replacement units to the satisfaction of the Acoustic Consultant, at no extra cost.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Provide continuous slot diffuser in all locations where individual plenums are shown connecting to linear slot diffusers. Continuous slot should continue from wall to wall. Refer to architect's drawings for extent of continuous slot. For these locations, remove pattern controller and provide light shield.
- B. Install diffusers, registers, and grilles level and plumb.
- C. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels,

locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

- D. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers. This includes slot diffusers. Provide sheet metal blank-off at edge of slot diffuser plenum when connecting individual plenum sections to continuous run of linear slot.
- E. For all Grilles, Registers and Diffusers mounted directly to ductwork or within 12 inches of the duct main, provide equalizing grid similar to Titus Model EG (square, round or rectangular depending on diffuser neck)

3.3 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 37 13

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SECTION 23 82 19 - FAN COIL UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes fan-coil units and accessories.

1.3 SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

- 1. Wiring Diagrams: Power, signal, and control wiring.
- 2. Indicate water, drain, and electrical rough-in connections.

- C. Coordination Drawings: Floor plans, reflected ceiling plans, and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

- 1. Ceiling suspension components.
- 2. Structural members to which fan-coil units will be attached.
- 3. Method of attaching hangers to building structure.
- 4. Size and location of initial access modules for acoustical tile.
- 5. Items penetrating finished ceiling, including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.

- 6. Perimeter moldings for exposed or partially exposed cabinets.

- D. Acoustic Performance: Provide certified sound power levels in accordance with AHRI 260 at the scheduled design conditions.

- E. Samples for Initial Selection: For units with factory-applied color finishes.

- F. Samples for Verification: For each type of fan-coil unit indicated.

- 1. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
- 2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

- G. Field quality-control test reports.
- H. Operation and Maintenance Data: For fan-coil units to include in emergency, operation, and maintenance manuals. In addition to items specified in DDC General Conditions, include the following:
 - 1. Maintenance schedules and repair part lists for motors, coils, integral controls, and filters.
- I. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2007, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- C. ASHRAE/IESNA 90.1-2007 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2007, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.5 COORDINATION

- A. Coordinate layout and installation of fan-coil units and suspension system components with other construction that penetrates or is supported by ceilings, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.
- B. Coordinate size and location of wall sleeves for outdoor-air intake.

1.6 WARRANTY

A. Guaranty From Contractor

- 1. Contractor's Guaranty Obligation: The Contractor shall promptly repair, replace, restore or rebuild, as the Commissioner may determine, any finished Work in which defects of materials or workmanship may appear or to which damage may occur because of such defects, during the one (1) year period subsequent to the date of Substantial Completion (or use and occupancy in accordance with the Contract).

- B. The manufacturer shall provide the parts warranty for equipment manufactured and all vendor supplied components. The said warranty shall cover replacement of all defective parts for a period of 12 months from substantial completion.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

- 1. Fan-Coil-Unit Filters: Furnish one spare filters for each filter installed.
- 2. Fan Belts: Furnish one spare fan belts for each unit installed. (For belt driven units only.)

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 DUCTED FAN-COIL UNITS

A. Manufacturers:

1. Trane.
2. Equal and Approved.

- B. Description: Factory-packaged and -tested units rated according to ARI 440, ASHRAE 33, NEC, and UL 1995.

- C. Coil Section Insulation: 1/2-inch thick coated glass fiber complying with ASTM C 1071 and attached with adhesive complying with ASTM C 916.

1. Fire-Hazard Classification: Insulation and adhesive shall have a combined maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.
2. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2007.

- D. Drain Pans: 16 gauge, welded corner, insulated galvanized steel with plastic liner, pitched to drain point.

- E. Auxiliary Drain Pans: Same materials as primary drain pan, extended to include all piping accessories.

- F. Chassis: Galvanized steel where exposed to moisture, with baked-enamel finish and removable access panels.

- G. Cabinets: Steel with baked-enamel finish in manufacturer's standard paint color.

1. Supply-Air Plenum: Sheet metal plenum finished and insulated to match the chassis.
2. Return-Air Plenum: Sheet metal plenum finished to match the chassis.

- H. Filters: Minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV 13) according to ASHRAE 52.2.

1. Pleated Cotton-Polyester Media: 90 percent arrestance and 13 MERV.
2. Filters shall be removable and shall be securely held in its frame.

- I. Hydronic Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain, strainers, shutoff valves, balancing device, and flushing & cleaning bypass connections.

1. Provide separate coils for heating and cooling.
2. Coils and associated piping shall be burst tested at 450 psig (air) and leak tested at 300 psig (air under water).

- 3. Units shall be furnished with a two pairs of stop valves, one each for chilled water supply and return and one each for hot water supply and return.

- J. Direct-Driven Fans: Double width, forward curved, centrifugal; with permanently lubricated, multispeed motor resiliently mounted in the fan inlet. Aluminum wheels, and galvanized-steel fan scrolls.
 - 1. Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 - a. Motors shall have integral thermal overload protection and shall operate satisfactorily at 90 percent of rated voltage on all speed settings, and at 10 percent overvoltage without undue magnetic noise.
 - b. Motors shall be high efficiency, three speed tap wound, permanent split capacitor type.

- K. Control devices and operational sequence are specified in Division 23 Section "Instrumentation and Control for HVAC" and on controls drawings.

- L. Noise Limits:
 - 1. FCUs shall be limited to the following basis of design octave band sound power levels re 10⁻¹²Watt per AHRI 260:

FCU G-1	Ground Lobby	63	125	250	500	1k	2k	4k	8k
	Ducted Discharge	77	82	73	68	66	64	60	55
	Casing	75	68	61	56	50	43	35	30
	Ducted Inlet	79	73	66	55	47	45	41	35

FCU M-1	Mezz (Th 1) Lobby	63	125	250	500	1k	2k	4k	8k
	Ducted Discharge	67	63	66	67	66	63	61	59
	Casing	61	56	58	62	56	39	31	34
	Ducted Inlet	64	58	68	60	44	50	51	47

FCU M-2	Prop Shop	63	125	250	500	1k	2k	4k	8k
	Ducted Discharge	79	77	66	64	61	58	56	48
	Ducted Inlet	81	71	59	47	41	40	38	32
	Casing	73	68	61	47	46	37	29	20

FCU M-3	Office	63	125	250	500	1k	2k	4k	8k
	Ducted Discharge	83	81	71	68	65	63	61	54
	Ducted Inlet	83	75	64	50	44	44	42	37
	Casing	75	70	64	52	49	40	33	23

FCU M-4	Theatre One	63	125	250	500	1k	2k	4k	8k
	Ducted Discharge	77	67	82	79	78	74	72	63
	Ducted Inlet	69	57	79	58	56	58	57	51
	Casing	69	61	71	70	63	45	32	30

FCU M-5	Th1 Ctrl Booth	63	125	250	500	1k	2k	4k	8k
	Ducted Discharge	83	80	69	65	63	60	58	50
	Ducted Inlet	82	74	62	48	42	41	39	33
	Casing	75	70	63	50	47	39	30	21

FCU 2-1	Theatre 2 Lobby	63	125	250	500	1k	2k	4k	8k
	Ducted Discharge	83	84	77	77	76	71	70	65
	Ducted Inlet	84	84	75	81	70	65	67	61
	Casing	70	67	53	53	55	58	46	41

FCU 2-2	Th2 Ctrl Booth	63	125	250	500	1k	2k	4k	8k
	Ducted Discharge	83	75	69	65	63	60	58	51
	Inlet and Casing	69	65	55	51	42	36	30	23

FCU 2-3	Theatre 2	63	125	250	500	1k	2k	4k	8k
	Ducted Discharge	80	79	77	66	68	75	69	67
	Ducted Inlet	81	74	74	54	52	62	56	52
	Casing	74	73	66	60	60	52	39	42

FCU 2-4	Theatre 2 Dressing	63	125	250	500	1k	2k	4k	8k
	Ducted Discharge	79	77	66	64	61	58	56	48
	Ducted Inlet	81	71	59	47	41	40	38	32
	Casing	73	68	61	47	46	37	29	20

2. Notify the engineer which bands if any exceed the sound power limits, e.g. for alternate equipment. Additional mitigation to control noise for units that exceed the limits shall be provided at no cost to the City of New York.

2.3 VARIABLE FREQUENCY DRIVES (VFDS)

- A. Variable frequency drives shall be provided, mounted and wired by the AHU manufacturer as indicated on the schedule and drawings. All standard and optional features shall be included within the VFD enclosure, unless otherwise specified. The VFDS shall be UL listed. The listing shall allow mounting in plenum or other air handling compartments.
- B. The VFD shall convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of three-phase AC motors. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor magnetization current suitable for centrifugal pump and fan control and to eliminate the need for motor derating.

- C. With the motor's rated voltage applied to the VFD input, the VFD shall allow the motor to produce full rated power at rated amps, RMS fundamental volts, and speed without using the motor's service factor. VFDs utilizing sine weighted/coded modulation (with or without 3rd harmonic injection) must provide data verifying that the motors will not draw more than full load current during full load and full speed operation.
- D. The VFD shall include an input full-wave bridge rectifier and maintain a fundamental power factor near unity regardless of speed or load.
- E. The VFD and options shall be tested to ANSI/UL Standard 508. The complete VFD, including all specified options, shall be assembled by the manufacturer, which shall be UL 508 certified for the building and assembly of option panels. Assembly of separate panels with options by a third-party is not acceptable. The appropriate UL stickers shall be applied to both the VFD and option panel, in the case where these are not contained in one panel.
- F. The VFD shall have DC link reactors on both the positive and negative rails of the DC bus to minimize power line harmonics. VFDs without DC link reactors shall provide a minimum 3% impedance line reactor.
- G. The VFDs full load amp rating shall meet or exceed NEC Table 430-150. The VFD shall be able to provide full rated output current continuously, 110% of rated current for 60 seconds and 160% of rated current for up to 0.5 second while starting.
- H. The VFD shall be able to provide full torque at any selected frequency from 28 Hz to base speed to allow driving direct drive fans without derating.
- I. An automatic energy optimization selection feature shall be provided standard in the VFD. This feature shall automatically and continually monitor the motor's speed and load and adjust the applied voltage to maximize energy savings and provide up to an additional 3% to 10% energy savings.
- J. Input and output power circuit switching shall be able to be accomplished without interlocks or damage to the VFD. Switching rate may be up to 1 time per minute on the input and unlimited on the output.
- K. An automatic motor adaptation test algorithm shall measure motor stator resistance and reactance to optimize performance and efficiency. It shall not be necessary to run the motor or de-couple the motor from the load to run the test.
- L. Galvanic and/or optical isolation shall be provided between the VFDs power circuitry and control circuitry to ensure operator safety and to protect connected electronic control equipment from damage caused by voltage spikes, current surges, and ground loop currents. VFDs not including either galvanic or optical isolation on both analog I/O and discrete I/O shall include additional isolation modules.
- M. The VFD shall minimize the audible motor noise through the use of an adjustable carrier frequency. The carrier frequency shall be automatically adjusted to optimize motor and VFD efficiencies while reducing motor noise.
- N. Protective Features
 - 1. Protection shall be provided against input transients, loss of AC line phase, output short circuit, output ground fault, overvoltage, undervoltage, VFD overtemperature and motor overtemperature. The VFD shall display all faults as words. Codes are not acceptable.
 - 2. The VFD shall be protected from sustained power or phase loss. The VFD shall provide full rated output with an input voltage as low as 90% of the nominal. The VFD shall

- continue to operate with reduced output with an input voltage as low as 164 V AC for 208/230 volt units, 313 V AC for 460 volt units, and 394 volts for 600 volts units.
3. The VFD shall incorporate a motor preheat circuit to keep the motor warm and prevent condensation build up in the stator.
 4. The VFD package shall include semi-conductor rated input fuses to protect power components.
 5. To prevent breakdown of the motor winding insulation, the VFD shall be designed to comply with IEC Part 34-17. Otherwise the AHU manufacturer shall ensure that inverter rated motors are supplied.
 6. The VFD shall include a "signal loss detection" circuit to sense the loss of an analog input signal such as 4 to 20 mA or 2 to 10 V DC, and shall be programmable to react as desired in such an instance.
 7. The VFD shall function normally when the keypad is removed while the VFD is running and continue to follow remote commands. No warnings or alarms shall be issued as a result of removing the keypad.
 8. The VFD shall catch a rotating motor operating forward or reverse up to full speed.
 9. The VFD shall be rated for 100,000 amp interrupting capacity (AIC).
 10. The VFD shall include current sensors on all three output phases to detect and report phase loss to the motor. The VFD shall identify which of the output phases is low or lost.
 11. The VFD shall continue to operate without faulting until input voltage reaches 300 V AC on 208/230 volt units, 539 V AC on 460 volt units, and 690 volts on 600 volt units.

O. Interface Features

1. Hand/Start, Off/Stop and Auto/Start selector switches shall be provided to start and stop the VFD and determine the speed reference. On units with bypass, a VFD/Off/Bypass selector switch shall be provided.
2. The VFD shall be able to be programmed to provide a 24 V DC output signal to indicate that the VFD is in Auto/Remote mode.
3. The VFD shall provide digital manual speed control. Potentiometers are not acceptable.
4. A lockable, alphanumeric backlit display keypad shall be provided. The keypad shall be remotely mountable up to 10 feet away using standard 9-pin cable.
5. The keypads for all sizes of VFDs shall be identical and interchangeable.
6. To set up multiple VFDs, it shall be possible to upload all setup parameters to the VFDs keypad, place that keypad on all other VFDs in turn and download the setup parameters to each VFD. To facilitate setting up VFDs of various sizes, it shall be possible to download from the keypad only size independent parameters.
7. The display shall be programmable to display in English, Spanish and French at a minimum.
8. A red FAULT light, a yellow WARNING light and a green POWER-ON light shall be provided. These indications shall be visible both on the keypad and on the VFD when the keypad is removed.
9. A quick setup menu with factory preset typical HVAC parameters shall be provided on the VFD eliminating the need for macros.
10. The VFD shall include a standard EIA-485 communications port and capabilities to be connected at a future date to a Johnson Controls N2 Metasys or Siemens FLN system at no additional cost to the City of New York. The connection shall be software selectable by the user.
11. At a minimum, the following points shall be controlled and/or accessible:
 - a. VFD Start/Stop
 - b. Speed reference
 - c. Fault diagnostics
 - d. Meter points

- 1) Motor power in HP
 - 2) Motor power in kW
 - 3) Motor kW-hr
 - 4) Motor current
 - 5) Motor voltage
 - 6) Hours run
 - 7) 2 Feedback signals
 - 8) DC link voltage
 - 9) Thermal load on motor
 - 10) Thermal load on VFD
 - 11) Heatsink temperature
-
12. Four additional Form C 230 volt programmable relays shall be available for field installation within the VFD
 13. LonWorks communication shall be available for factory or field installation within the VFD.
 14. Two set-point control interfaces (PID control) shall be standard in the unit. The VFD shall be able to look at two feedback signals, compare with two set-points and make various process control decisions.
 15. Floating point control interface shall be provided to increase/decrease speed in response to contact closures.
 16. Four simultaneous displays shall be available. They shall include frequency or speed, run time, output amps and output power. VFDs unable to show these four displays simultaneously shall provide panel meters.
 17. Sleep mode shall be provided to automatically stop the VFD when its speed drops below set "sleep" level for a specified time. The VFD shall automatically restart when the speed command exceeds the set "wake" level.
 18. The sleep mode shall be functional in both follower mode and PID mode.
 19. A run permissive circuit shall be provided to accept a "system ready" signal to ensure that the VFD does not start until dampers or other auxiliary equipment are in the proper state for VFD operation. The run permissive circuit shall also be capable of sending an output signal as a start command to actuate external equipment before allowing the VFD to start.
 20. The following displays shall be accessible from the control panel in actual units: Reference Signal Value, Output Frequency in Hz or percent, Output Amps, Motor HP, Motor kW, kWhr, Output Voltage, DC Bus Voltage, VFD Temperature in degrees, and unit CFM.
 21. The display shall be programmed to read in inches of water column (in-wg).
 22. The VFD shall be able to be programmed to sense the loss of load and signal a no load/broken belt warning or fault.
 23. If the temperature of the VFDs heat sink rises to 80°C, the VFD shall automatically reduce its carrier frequency to reduce the heat sink temperature. If the temperature of the heat sink continues to rise the VFD shall automatically reduce its output frequency to the motor. As the VFDs heat sink temperature returns to normal, the VFD shall automatically increase the output frequency to the motor and return the carrier frequency to its normal switching speed.
 24. The VFD shall have temperature controlled cooling fans for quiet operation and minimized losses.
 25. The VFD shall store in memory the last 10 faults and related operational data.
 26. Eight programmable digital inputs shall be provided for interfacing with the systems control and safety interlock circuitry.
 27. Two programmable relay outputs, one Form C 240 V AC, one Form A 30 V AC, shall be provided for remote indication of VFD status.
 28. Three programmable analog inputs shall be provided and shall accept a direct-or-reverse acting signal. Analog reference inputs accepted shall include two voltage (0 to 10 V DC, 2 to 10 V DC) and one current (0 to 20 mA, 4 to 20 mA) input.

29. Two programmable 0 to 20 mA analog outputs shall be provided for indication of VFD status. These outputs shall be programmable for output speed, frequency, current and power. They shall also be programmable to provide a selected 24V DC status indication.
30. Under fire mode conditions, the VFD shall be able to be programmed to automatically default to a preset speed.

P. Adjustments

1. The VFD shall have an adjustable carrier frequency in steps of not less than 0.1 kHz to allow tuning the VFD to the motor.
2. A minimum of sixteen preset speeds shall be provided.
3. Four acceleration and four deceleration ramps shall be provided. Accel and decel time shall be adjustable over the range from 0 to 3,600 seconds to base speed. The shape of these curves shall be automatically contoured to ensure no-trip acceleration and deceleration.
4. Four current limit settings shall be provided.
5. If the VFD trips on one of the following conditions, the VFD shall be programmable for automatic or manual reset: undervoltage, overvoltage, current limit and inverter overload.
6. The number of restart attempts shall be selectable from 0 through 20 or infinitely and the time between attempts shall be adjustable from 0 through 600 seconds.
7. An automatic "on delay" shall be selectable from 0 to 120 seconds.

Q. Service Conditions

1. VFDs shall provide full output in an ambient temperature from -10 to 50°C (14 to 104°F).
2. VFDs shall provide full output in a relative humidity from 0 to 95%, non-condensing.
3. VFDs shall provide full output up to 3,300 feet elevation without derating.
4. VFDs shall provide full output with an AC line voltage variation from -10 to +10% of nominal voltage.
5. No side clearance shall be required for cooling of any units. All power and control wiring shall be done from the bottom.

R. Warranty

1. The VFD shall be warranted by the manufacturer for a period of 42 months from date of shipment, or 36 months from start-up, whichever occurs first. The warranty shall include parts, labor, travel costs and living expenses incurred by the manufacturer to provide factory-authorized on-site service.

2.4 FACTORY-INSTALLED MOTOR WIRE TERMINATION, VFD, AND COMBINATION STARTER/DISCONNECT ENCLOSURES

- A. VFDs shall be factory mounted on the drive side of the fan section. VFD may be mounted on the interior of the unit, accessible from the unit exterior through an access door, or on the casing exterior in a NEMA Type 1 enclosure for indoor units. If not mounted on the fan section due to NEC disconnect height limitations or serviceability constraints in the mechanical equipment room, VFD may be mounted in another location other than the fan.
- B. Any welds shall be properly finished with no rough edges. Enclosures shall house circuit breaker disconnects, bypass circuitry, Drive-OFF-Bypass switches, manual speed controls, and control transformers. VFDs and starter/disconnects shall have an external disconnect located on the outside of the access door.

2.5 FACTORY WIRING OF LIGHTS, VFDS, AND COMBINATION STARTERS/DISCONNECTS

- A. VFDS shall be wired per NEC, UL, and NFPA 90A requirements. Units with factory-mounted controls shall also include power wiring from the VFD or starter/disconnect control transformer to the control system transformers. Units with VFDS and factory-mounted controls shall have a binary start-stop signal and an analog speed signal wired from the direct digital controller to the VFD.
- B. All power wiring for voltages greater than 24V and traveling through multiple unit sections shall be contained in an enclosed, metal, power-wiring raceway or EMT. Sections less than 6' in length may be contained in FMC.

2.6 FACTORY COMMISSIONING OF VFDS AND COMBINATION STARTER/DISCONNECTS

- A. After mounting and wiring of VFDS, on the AHUs, trained factory personnel shall ensure proper operation of each VFD, through a thorough factory test. Testing shall include a Hypot test of unit wiring to ensure that no weaknesses exist in wiring or motor. Each VFD shall be energized and the fan run to ensure the VFD will operate throughout the usable range of the drive and that the fan rotation is correct. Each VFD with bypass shall also be tested in the bypass position to ensure the bypass is operational.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine areas to receive fan-coil units for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in for piping and electrical connections to verify actual locations before fan-coil-unit installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install fan-coil units level and plumb.
- B. Install fan-coil units to comply with NFPA 90A.
- C. Suspend fan-coil units from structure with spring hangers. Comply with requirements for vibration isolation. Vibration isolators are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
- D. Verify locations of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install devices 48 inches above finished floor.
- E. Install new filters in each fan-coil unit within two weeks after Substantial Completion.
- F. Install leak sensor in auxiliary drain pan.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. Specific connection requirements are as follows:

1. Install piping adjacent to machine to allow service and maintenance.
2. Connect piping to fan-coil-unit factory hydronic piping package. Install piping package if shipped loose.
3. Connect condensate drain to indirect waste.
 - a. Install condensate trap of adequate depth to seal against the pressure of fan. Install cleanouts in piping at changes of direction.

- B. Connect supply and return ducts to fan-coil units with flexible duct connectors specified in Division 23 Section "Air Duct Accessories." Comply with safety requirements in UL 1995 for duct connections.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

- A. **Manufacturer's Field Service:** Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
 1. **Operational Test:** After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
 3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace malfunctioning units and retest as specified above.

3.5 ADJUSTING

- A. Adjust initial temperature and humidity set points.
- B. **Occupancy Adjustments:** When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.

3.6 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
- B. Refer to "Owner's **General** Commissioning Requirements" for additional requirements.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train the City of New York's maintenance personnel to adjust, operate, and maintain fan-coil units. Refer to Division 01 Section "General Commissioning Requirements" for additional requirements.

END OF SECTION 23 82 19

SECTION 23 82 33 - CONVECTORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

- 1. Hydronic finned-tube radiators.

1.3 SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each type of product indicated.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Plans, elevations, sections, and details.
 - 2. Details of custom-fabricated enclosures indicating dimensions.
 - 3. Location and size of each field connection.
 - 4. Location and arrangement of piping valves and specialties.
 - 5. Location and arrangement of integral controls.
 - 6. Enclosure joints, corner pieces, access doors, and other accessories.
 - 7. Wiring Diagrams: Power, signal, and control wiring.
- C. Coordination Drawings: Floor plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Structural members, including wall construction, to which convection units will be attached.
 - 2. Method of attaching convection units to building structure.
 - 3. Penetrations of fire-rated wall and floor assemblies.
- D. Color Samples for Initial Selection: For units with factory-applied color finishes.
- E. Color Samples for Verification: For each type of exposed finish required.
- F. Field quality-control test reports.
- G. Operation and Maintenance Data: For convection heating units to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 HOT-WATER FINNED-TUBE RADIATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Sterling.
 - 2. Vulcan.
 - 3. Slant/Fin.
- B. Performance Ratings: Rate finned-tube radiators according to Hydronics Institute's "I=B=R Testing and Rating Standard for Finned-Tube (Commercial) Radiation."
- C. Heating Elements: Copper tubing mechanically expanded into flanged collars of evenly spaced aluminum fins resting on element supports. One tube end shall be belled.
- D. Element Supports: Ball-bearing cradle type to permit longitudinal movement on enclosure brackets.
- E. Support Brackets: Locate at maximum 36-inch spacing to support front panel and element.
- F. Accessories: Filler sections, corners, relay sections, and splice plates all matching the enclosure and grille finishes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive convection heating units for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in for hydronic-piping connections to verify actual locations before convection heating unit installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FINNED-TUBE RADIATOR INSTALLATION

- A. Install units level and plumb.
- B. Install enclosure continuously around corners, using outside and inside corner fittings.
- C. Join sections with splice plates and filler pieces to provide continuous enclosure.
- D. Install access doors for access to valves.

- E. Install enclosure continuously from wall to wall.
- F. Install valves within reach of access door provided in enclosure.
- G. Install air-seal gasket between wall and recessing flanges or front cover of fully recessed unit.
- H. Protect units with protective covers during balance of construction.
- I. Piping connections shall accommodate expansion of the finned tube.
- J. Provide air vents.
- K. Vacuum clean units after completion of construction.
- L. A mock-up of the installation of one trench heater shall be carried out by this at the job site at a location to be chosen by the Architect. Coordinate mock-up schedule with any other architectural mock-ups specified. The mock-up shall include the radiator, support method, all piping, valves, air vents, brazing, escutcheon plates, pipe sleeving and floor penetration acoustic sealing, and gratings. The mock-up shall be reviewed by the Owner's Representative before other radiators are installed.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in Division 23 Section "Hydronic Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect hot-water units and components to piping according to Division 23 Section "Hydronic Piping."
 - 1. Install shutoff valves on inlet and outlet, and balancing valve on outlet.
- C. Install control valves as required by Division 23 Section "Instrumentation and Control for HVAC."
- D. Install piping adjacent to convection heating units to allow service and maintenance.
- E. Ground electric convection heating units according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- F. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

- B. Remove and replace convection heating units that do not pass tests and inspections and retest as specified above.

END OF SECTION 23 82 33

SECTION 23 82 39 - UNIT HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Cabinet unit heaters with centrifugal fans and hot-water heating coils.

1.3 SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each product indicated.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

- 1. Plans, elevations, sections, and details.
- 2. Location and size of each field connection.
- 3. Details of anchorages and attachments to structure and to supported equipment.
- 4. Equipment schedules to include rated capacities, operating characteristics, furnished specialties, and accessories.
- 5. Location and arrangement of integral controls.
- 6. Wiring Diagrams: Power, signal, and control wiring.

- C. Coordination Drawings: Floor plans, reflected ceiling plans, and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

- 1. Suspended ceiling components.
- 2. Structural members to which unit heaters will be attached.
- 3. Method of attaching hangers to building structure.
- 4. Size and location of initial access modules for acoustical tile.
- 5. Items penetrating finished ceiling, including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.

- 6. Perimeter moldings for exposed or partially exposed cabinets.

- D. Samples for Initial Selection: Finish colors for units with factory-applied color finishes.

- E. Samples for Verification: Finish colors for each type of cabinet unit heater and wall and ceiling heaters indicated with factory-applied color finishes.

- F. **Manufacturer Seismic Qualification Certification:** Submit certification that cabinet unit heaters, accessories, and components will withstand seismic forces defined in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment." Include the following:
1. **Basis for Certification:** Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
 2. **Dimensioned Outline Drawings of Equipment Unit:** Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. **Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.**
- G. **Field quality-control test reports.**
- H. **Operation and Maintenance Data:** For cabinet unit heaters to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

- A. **Electrical Components, Devices, and Accessories:** Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. **ASHRAE Compliance:** Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- C. **ASHRAE/IESNA 90.1-2004 Compliance:** Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.5 WARRANTY

- A. **Guaranty from Contractor**
1. **Contractor's Guaranty Obligation:** The Contractor shall promptly repair, replace, restore or rebuild, as the Commissioner may determine, any finished Work in which defects of materials or workmanship may appear or to which damage may occur because of such defects, during the one (1) year period subsequent to the date of Substantial Completion (or use and occupancy in accordance with the Contract).
- B. The manufacturer shall provide the parts warranty for equipment manufactured and all vendor supplied components. The said warranty shall cover replacement of all defective parts for a period of 12 months from equipment start up.

1.6 EXTRA MATERIALS

- A. **Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.**
1. **Cabinet Unit Heater Filters:** Furnish one spare filter for each filter installed.

PART 2 - PRODUCTS

2.1 CABINET UNIT HEATERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on drawings or a comparable product by one of the following:
1. Trane
 2. Sterling
 3. Airtherm; a Mestek Company
- B. Description: A factory-assembled and -tested unit complying with ARI 440.
1. Comply with UL 2021.
- C. Cabinet: Steel with baked-enamel finish with manufacturer's custom paint, in color selected by Architect.
1. Vertical Unit, Exposed Front Panels: Minimum 0.0528-inch-thick (16-gauge), galvanized, sheet steel, removable panels with channel-formed edges secured with tamperproof cam fasteners.
 2. Horizontal Unit, Exposed Bottom Panels: Minimum 0.0528-inch-thick (16-gauge), galvanized, sheet steel, removable panels secured with tamperproof cam fasteners and safety chain.
 3. Recessing Flanges: Steel, finished to match cabinet.
 4. Control Access Door: Key operated.
 5. Extended Piping Compartment: 8-inch-wide piping end pocket. Piping shall be fully concealed and accessible within the heater cabinet.
 6. False Back: Minimum 0.0428-inch thick (16-gauge) steel, finished to match cabinet.
- D. Filters: Minimum arrestance according to ASHRAE 52.1 and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
1. Washable Foam: 70 percent arrestance and MERV 3.
 2. Filters shall be slide int type and locked securely in place.
- E. Hot-Water Coil: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain.
- F. Fan and Motor Board: Removable.
1. Fan: Forward curved, double width, centrifugal; directly connected to motor. Thermoplastic or painted-steel wheels, and aluminum, painted-steel, or galvanized-steel fan scrolls.
 2. Motor: Permanently lubricated, multispeed; resiliently mounted on motor board. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 3. Factory wire motors and controls for a single field connection with disconnect switch.
- G. Coordinate control devices and operational sequences with Division 23 Sections "Instrumentation and Control for HVAC" and the controls drawings.
- H. Characteristics:

1. Cabinet:
 - a. Vertical, Fully Recessed
 - 1) Air Inlet and Outlet: Front, extruded-aluminum bar grille inlet and extruded-aluminum bar grille outlet.
 - 2) Air Inlet: Front, extruded-aluminum bar grille.
 - 3) Air Outlet: Front, extruded-aluminum bar grille.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in for electrical connections to verify actual locations before unit heater installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install wall boxes in finished wall assembly; seal and weatherproof. Joint-sealant materials and applications are specified in Division 07 Section "Joint Sealants."
- B. Install cabinet unit heaters to comply with NFPA 90A.
- C. Suspend cabinet unit heaters from structure with elastomeric hangers and seismic restraints. Vibration isolators and seismic restraints are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
- D. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.
- E. Install new filters in each fan-coil unit within two weeks of Substantial Completion.

3.3 CONNECTIONS

- A. Connect supply and return ducts to cabinet unit heaters with flexible duct connectors specified in Division 23 Section "Air Duct Accessories."
- B. Comply with safety requirements in UL 1995.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
 - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
 - 3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace malfunctioning units and retest as specified above.

3.5 ADJUSTING

- A. Adjust initial temperature set points.
- B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train the City of New York's maintenance personnel to adjust, operate, and maintain cabinet unit heaters. Refer to DDC General Conditions.

END OF SECTION 23 82 39

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**CONTRACT # 4
ELECTRICAL WORK**

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SECTION 260013 - ELECTRICAL CONTRACTOR WORK
ALLOWANCE FOR INCIDENTAL ASBESTOS ABATEMENT

1.01 SCOPE FOR ASBESTOS ABATEMENT WORK

- A. The "General Conditions" apply to the work of this Section.
- B. The Asbestos abatement contractor shall remove asbestos containing materials as needed to perform the other work of this Contract when discovered during the course of work. When required, the Asbestos abatement contractor shall replace the ACM with non-asbestos containing materials. An allowance of **\$5,000.00** for the **Electrical Contractor** is herein established for this incidental work when so ordered and authorized by the Commissioner.
- C. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE APPLICABLE PROVISIONS OF THE RULES AND REGULATIONS OF THE ASBESTOS CONTROL PROGRAM AS PROMULGATED BY TITLE 15 CHAPTER I OF RCNY AND NEW YORK STATE DEPARTMENT OF LABOR INDUSTRIAL CODE RULE 56 CITED AS 12 NYCRR, PART 56 WHICHEVER IS MORE STRINGENT AS PER LATEST AMENDMENTS TO THESE LAWS AND AS MODIFIED HEREIN BY THESE SPECIFICATIONS.
- D. ALL DISPOSAL OF ASBESTOS CONTAMINATED MATERIAL SHALL BE PER LOCAL LAW 70/85.
- E. THE ASBESTOS ABATEMENT CONTRACTOR'S ATTENTION IS DIRECTED TO THE FACT THAT CERTAIN METHODS OF ASBESTOS ABATEMENT ARE PROTECTED BY PATENTS. TO DATE, PATENTS HAVE BEEN ISSUED WITH RESPECT TO "NEGATIVE PRESSURE ENCLOSURE" OR "NEGATIVE-AIR" OR "REDUCED PRESSURE" AND "GLOVE BAG".
- F. THE ASBESTOS ABATEMENT CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR AND SHALL HOLD THE DEPARTMENT OF DESIGN AND CONSTRUCTION AND THE CITY HARMLESS FROM ANY AND ALL DAMAGES, LOSSES AND EXPENSES RESULTING FROM ANY INFRINGEMENT BY THE ASBESTOS ABATEMENT CONTRACTOR OF ANY PATENT, INCLUDING BUT NOT LIMITED TO THE PATENTS DESCRIBED ABOVE, USED BY THE ASBESTOS ABATEMENT CONTRACTOR DURING PERFORMANCE OF THIS AGREEMENT.
- G. "Asbestos" shall mean any hydrated mineral silicate separable into commercially usable fibers, including but not limited to chrysotile (serpentine), amosite (cumingtonite-grunerite), crocidolite (riebeckite), tremolite, anthrophyllite and actinolite.

- H. Prior to starting, the Asbestos abatement contractor must notify the Commissioner of the Department of Design and Construction if he/she anticipates any difficulty in performing the Work as required by these Specifications. The Asbestos abatement contractor is responsible to prepare and submit all filings, notifications, etc. required by all City, State and Federal regulatory agencies having jurisdiction.

The Asbestos abatement contractor is responsible for submitting the Asbestos Project Notification Form (ACP-7 Form) to the Department of Environmental Protection, Asbestos Control Program, as per Title 15, Chapter I of RCNY and to the NYSDOL as per Industrial Code Rule 56.

The Asbestos abatement contractor is responsible for preparing, and submitting Asbestos Variance Application (ACP-9). If a Variance is required, the Asbestos abatement contractor is responsible to retain a NYSDOL Asbestos Project Designer, as defined in Title 15, Chapter 1 of the RCNY to prepare and submit the required variance.

The Asbestos abatement contractor is responsible for preparing and submitting an Asbestos Abatement Permit and/or Work Place Safety Plans (WPSP) that may be required for the completion of the Contract or incidental work. If such plans are required, the Asbestos abatement contractor is responsible to retain a NYSDOL Licensed Design Professional as defined in Title 15, Chapter 1 of the RCNY to prepare and submit the required plans.

The Asbestos abatement contractor is responsible for the submission of all required documents to the NYCDEP to acquire the appropriate Asbestos Project Conditional Closeout (ACP-20) and/or Asbestos Project Completion Forms (ACP-21) on a timely basis for the completion of the incidental work encountered under this contract.

The Asbestos abatement contractor will be required to attend an on-site job meeting with the Construction Project Manager prior to the start of work to examine conditions and plan the sequence of operations, etc.

The Asbestos abatement contractor shall have a NYSDOL/NYCDEP Asbestos Supervisor onsite to oversee the work and conduct a final visual inspection as required by both Title 15, Chapter 1 of the RCNY and NYSDOL Industrial Code Rule 56.

- I. All work shall be done during regular working hours unless the Asbestos abatement contractor requests authorization to work in other than regular working hours and such authorization is granted by the Commissioner. (Regular work hours are those hours during which any given facility, in which work is to be done, is customarily open and functioning, normally between the hours of 8:00 A.M. and 4:00 P.M. Monday - Friday.) If such work schedule is authorized by the Commissioner, the work shall be done at no additional cost to the City.

- J. The Commissioner may order that work be done in other than regular working hours as herein by defined and this order may require the Asbestos abatement contractor to pay premium or overtime wages to complete the work. If the Commissioner orders work in other than regular working hours, the Asbestos abatement contractor shall multiply the unit price for that portion of the work requiring premium wages by 1.50 when computing payment in accordance with Paragraph 1.09. All requests for premium payment must be supported by certified payroll sheets and field sheets approved by the Construction Project Manager.

1.02 QUALIFICATIONS OF ASBESTOS ABATEMENT CONTRACTOR

- A. Requirements: The asbestos abatement contractor must demonstrate compliance with the special experience requirements set forth in subparagraphs (1) through (5) below. The asbestos abatement contractor must, submit documentation demonstrating compliance with all listed requirements. Such documentation shall include without limitation, all required licenses, certificates, and documentation.
1. The asbestos abatement contractor must, whether an individual, corporation, partnership, joint venture or other legal entity, must demonstrate for the three year period prior to the work, that it has been licensed by the New York State Department of Labor, as an "Asbestos abatement contractor".
 2. The asbestos abatement contractor must, for the three year period prior to the work, have been in the business of providing asbestos abatement services as a routine part of its daily operations.
 3. The asbestos abatement contractor proposing to do asbestos abatement work must be thoroughly experienced in such work and must provide evidence of having successfully performed and completed in a timely fashion at least five (5) asbestos abatement projects of similar size and complexity. The aggregate cost of these projects must be at least \$250,000.00 in each of the three years.
 4. For each project submitted to meet the experience requirements set forth above, the asbestos abatement contractor must submit the following information for the project; name and location of the project; name title and telephone number of the owner or the owner's representative who is familiar with the asbestos abatement contractor's work, brief description of the work completed as a prime or sub-asbestos abatement contractor; amount of contract or subcontract and the date of completion.
 5. The asbestos abatement contractor must demonstrate that it has the financial resources, supervisory personnel and equipment necessary to carry out the work and to comply with the required performance schedule, taking into consideration other business commitments. The asbestos

abatement contractor must submit such documentation as may be required by the Department of Design and Construction to demonstrate that it has the requisite capacity to perform the required services of this contract.

- B. Insurance Requirements: The asbestos abatement contractor must provide asbestos liability insurance in the following amount: 1 million dollars per occurrence, 2 million dollars aggregate (combined single limit). The City of New York shall be named as an additional insured on such insurance policy.
- C. Throughout the specifications, reference is made to codes and standards which establish qualities and types of workmanship and materials, and which establish methods for testing and reporting on the pertinent characteristics thereof.

1.03 ASBESTOS ABATEMENT CONTRACTOR RESPONSIBILITIES

The Asbestos abatement contractor will visit the subject location within one (1) working day of notification to ascertain actual work required. If the project is identified as being "urgent", then work shall commence no later than 48 hours from the time of notification. In this event, the asbestos abatement contractor shall immediately notify when applicable EPA NESHAPS Coordinator, NYSDOL Asbestos Control Bureau and NYCDEP Asbestos Control Program of start of the work and file the necessary Asbestos Notifications and any applicable Variance Applications with the regulatory agencies cited above..

In the event that the project is not classified as "urgent" the Asbestos abatement contractor shall notify the EPA NESHAPS Coordinator, NYSDOL and NYCDEP by submitting the requisite asbestos project notification forms, postmarked 10 days before activity begins if 260 linear feet or more and/or 160 square feet or more of asbestos containing material will be disturbed.

The following information must be included in the notification:

- A. Name and address of building City or operator;
- B. Project description:
 - 1. Size - square feet, number of linear feet, etc;
 - 2. Age - date of construction and renovations (if known);
 - 3. Use - i.e., office, school, industrial, etc.
 - 4. Scope - repair, demolition, cleaning, etc.
- C. Amount of asbestos involved in work and an explanation of techniques used to determine the amount;

- D. Building location/address, including Block and Lot numbers;
- E. Work schedule including the starting and completion dates;
- F. Abatement methods to be employed;
- G. Procedures for removal of asbestos-containing material;
- H. Name, title and authority of governmental representative sponsoring project.

1.04 WORK INCLUDED IN UNIT PRICE

The Asbestos abatement contractor will be paid a basic unit price of **\$25.00** per square feet for the removal and disposal of asbestos containing material and replacement of the same with non-asbestos containing materials.

Unit price shall include all costs necessary to do the work of this Contract, including but not limited to: labor, materials, equipment, utilities, disposal, insurance, overhead and profit.

1.05 AIR MONITORING – ASBESTOS ABATEMENT CONTRACTOR

- A. "Air Sampling" shall mean the process of measuring the fiber content of a known volume of air collected during a specific period of time. The procedure utilized for asbestos follows the NIOSH Standard Analytical Method 7400 or the provisional transmission electron microscopy methods developed by the USEPA and/or National Institute of Standard and Technology which are utilized for lower detectability and specific fiber identification.
- B. Air monitoring of Asbestos abatement contractor's personnel will be performed in conformance with OSHA requirements, (All costs associated with this work are deemed included in the unit price.).
- C. Qualifications of Testing Laboratory:

The industrial hygiene laboratory shall be a current proficient participant in the American Industrial Hygiene Association (AIHA) PAT Program. The laboratory identification number shall be submitted and approved by the City. The laboratory shall be accredited by the AIHA and New York State Department of Health Environmental Laboratory Approval Program (ELAP).

Note: Work area air testing and analysis before, during and upon completion of work (clearance testing) will be performed by a Third Party Air Monitor under separate Contract with the City.

1.06 THIRD PARTY MONITORING AND LABORATORY

- A. The NYCDDC, at its own expense, will employ the services of an independent Third Party Air Monitoring Firm and Laboratory. The Third Party Air Monitor will perform air sampling activities and project monitoring at the Work Site.
- B. The Laboratory will perform analysis of air samples utilizing Phase Contrast Microscopy (PCM) and/or Transmission Electron Microscopy (TEM).
- C. The Third Party Air Monitoring Firm and the designated Project Monitor shall have access to all areas of the asbestos removal project at all times and shall continuously inspect and monitor the performance of the Asbestos abatement contractor to verify that said performance complies with this Specification. The Third-Party Air Monitor shall be on site throughout the entire abatement operation.
- D. The NYCDDC will be responsible for costs incurred with the Third Party Air Monitoring Firm and laboratory work. Any subsequent additional testing required due to limits exceeded during initial testing shall be paid for by the Asbestos abatement contractor.

1.07 PAYMENT REQUEST DOCUMENTATION

- B. The following information shall be included for each payment request:
 - 1. Description of work performed.
 - 2. Linear footage and pipe sizes involved.
 - 3. Square footage for boiler & breaching insulation removed.
 - 4. Square footage of non pipe and boiler areas removed, patched, enclosed, sealed, or painted.
 - 5. Square footage of encapsulation, sealing, patching, and painting involved.
 - 6. Total cost associated with compliance with the assigned task.
 - 7. Architectural, Electrical, HVAC, Plumbing, etc. work incidental to the Asbestos Abatement Work.
 - 8. A certified copy (in form 4312-39) to the Comptroller or Financial Officer of the New York City to the effect that the financial statement is true.
 - 9. A signed copy (in form 6506q-6) of certificate of compliance with non-discriminatory provisions of the Contract.

10. Attach a copy of valid workmen compensation insurance.
 11. Valid asbestos insurance per occurrence.
 12. General liability insurance when required.
- C. Each payment request shall include a grand total for all work completed that billing period, the landfill waste manifests and a copy of waste transporter permit. The Department of Design and Construction will inspect the work performed, review the cost and approve or disapprove requests for payment.
- D. EXPOSURE LOG: With this final payment, the Asbestos abatement contractor shall submit a listing of the names and social security numbers of all employees actively engaged in the abatement work of this Contract. This list shall include a summary showing each part of the abatement work in which the employee was engaged and the dates thereof.

1.08 QUANTITY CALCULATIONS

In order to determine the square footage involved for the various pipe sizes of pipe insulation that might be encountered, the following table is to be used.

<u>PIPE INSULATION SIZE O.D.</u>	<u>PIPE SIZE O.D.</u>	<u>SQUARE FOOTAGE PER LINEAR FOOT</u>
2-1/2"	1/2"	0.65
2-3/4"	3/4"	0.72
3"	1"	0.79
3-1/4"	1-1/4"	0.85
3-1/2"	1-1/2"	0.92
4"	2"	1.05
4-1/2"	2-1/2"	1.18
5"	3"	1.31
6"	3-1/4"	1.57
7"	3-1/2"	1.83
8"	4"	2.09
9"	5"	2.36
10"	6"	2.62
12"	8"	3.14
14"	10"	3.67
16"	12"	4.19
18"	14"	4.71

1.09 METHOD OF PAYMENT

Payment shall be made in accordance with Items A through R below. Payment shall be calculated based on the actual quantity of the item performed by the asbestos abatement

contractor, times the unit price specified below. Credits may apply to certain times, as specified below.

- A. **REMOVAL, DISPOSAL AND REPLACEMENT OF ASBESTOS CONTAINING PIPE INSULATION:** Actual linear footage, multiplied by the square footage factor listed for the respective pipe size in Section 1.09, multiplied by the unit price in Section 1.05.

EXAMPLE: 100 lin.ft. of 1/2" pipe and 100 lin.ft. of 6" pipe, including elbows, tees. Flanges, etc.

$$100 \times 0.65 = 65 \text{ sq.ft.} \quad 65 \times \text{unit price} = \text{Payment}$$

$$100 \times 2.62 = 262 \text{ sq.ft.} \quad 262 \times \text{unit price} = \text{Payment}$$

- B. **REMOVAL, DISPOSAL AND REPLACEMENT OF BOILER INSULATION:** (all types including Silicate Block and including the removal/replacement of metal jacketing) Payment shall be made at 1.5 times the unit price per square foot.

EXAMPLE: Item B. removal and replacement of 1000 S.F. of boiler insulation (incl. Silicate block)

$$1000 \text{ S.F.} \times (1.5) \times \text{the Unit Price} = \text{Payment}$$

- C. **REMOVAL, DISPOSAL AND REPLACEMENT OF TANK INSULATION:** (all types including removal/replacement of metal jacketing) Payment shall be made at 1.5 times the unit price per square foot.
- D. **REMOVAL, DISPOSAL AND REPLACEMENT OF BOILER UPTAKE, & BREACHING INSULATION:** (all types including stiffening angles and wire lath) Payment shall be made at 2.0 times the unit price per square foot.
- E. **REMOVAL, DISPOSAL AND REPLACEMENT OF DUCT INSULATION:** Payment shall be made at 1.0 times the unit price per square foot.
- F. **REMOVAL, DISPOSAL AND REPLACEMENT OF SOFT ASBESTOS CONTAINING MATERIAL:** (Including sprayed-on fire proofing and sound proofing) Payment shall be made at 1.0 times the unit price per square foot of surface area. Area of irregular surfaces must be calculated and confirmed with DDC representative.
- G. **ACOUSTIC PLASTER REPAIR AND/OR ENCAPSULATION:** Payment shall be made at 0.5 times the unit price per square foot.
- H. **PATCHING OR REPAIR** of items listed in A through F will be paid at 0.33 times the unit price per square foot.

- I. **REMOVAL, DISPOSAL AND REPLACEMENT OF WATERPROOFING ASBESTOS CONTAINING MATERIAL:** (including friable and non-friable waterproofing material from interior and exterior walls, floors, foundations, penetrations, louvers, vents and openings other than windows, doors and skylights) Payment shall be made at 0.5 times the unit price per square foot.
- J. **REMOVAL, DISPOSAL AND REPLACEMENT OF ASBESTOS CONTAINING ELECTRICAL WIRING INSULATION:** (including friable and non-friable wiring insulation) Payment shall be made at 0.33 times the unit price per square foot.
- K. **PAINTING:** Payment shall be made at 0.05 times the unit price per square foot.
- L. **REMOVAL AND DISPOSAL OF ASBESTOS-CONTAINING PLASTER:** from ceilings and walls, including any wire lath and disposal as asbestos containing waste. Payment shall be made at 0.80 times the unit price per square foot.
- M. **REMOVAL AND DISPOSAL OF ASBESTOS-CONTAINING FLOOR TILES, CEILING TILES, TRANSITE PANELS:** (including any adhesive, glue, mastic and/or underlayment) and disposal as asbestos containing waste. Payment shall be made at 0.40 times the unit price per square foot. If multiple layers are discovered, each additional layer shall be paid at 0.20 times the unit price per square foot.
- N. **ADDITIONAL CLEAN UP/HOUSEKEEPING OF WORK AREA:** (excluding pre-cleaning of work area required by regulations) HEPA vacuuming and wet cleaning of asbestos contaminated surface. Payment shall be made at 0.20 times the unit price per square foot. When GLOVE BAG is employed to remove ACM, cost of HEPA vacuuming and wet cleaning of floor area up to 3 feet on each side of glove-bag shall be included in unit price and no extra payment will be made.
- O. **REMOVAL, DISPOSAL OF ASBESTOS-CONTAINING ROOFING MATERIAL:** including mastic, flashing and sealant compound and provide temporary asbestos-free roof covering consisting of one layer of rolled roofing paper sealed with asphaltic roofing compound. Payment shall be made at 0.8 times the unit price per square foot. Credit at a rate of 0.33 times the unit price will be taken for each square foot of temporary roof covering which the Asbestos abatement contractor is directed not to install.
- P. **PICK-UP AND DISPOSAL OF GROSS DEBRIS:** (excluding any waste generated from abatement under Item A-R) at a rate of \$150 per cubic yard for asbestos contaminated waste and \$75 per cubic yard for non-asbestos contaminated waste. This cost includes all labor and material cost associated with work.

- Q. **REMOVAL OF ASBESTOS-CONTAINING BRICK, BLOCK, MORTAR, CEMENT OR CONCRETE:** along with all surfacing materials including wire lath and/or other supporting structures and disposal as ACM waste. Payment shall be made at a rate of \$25.00 per cubic foot of material removed.
- R. **REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING WINDOW/DOOR CAULKING:** including friable and non-friable caulking, weather-stripping, glazing, sealants or other waterproofing materials applied to windows, doors, skylights, etc. Payment shall be made at the rate of \$400.00 per opening regardless of size or configuration. This cost includes labor, consumable materials, set-up/breakdown, removal and disposal, as required.

Note 1: CREDIT: For items listed in A through F, a credit at a rate of 0.33 times the unit price, times the respective multiplier (for each item) will be taken for each square foot of insulation which the asbestos abatement contractor is not directed to reapply.

Note 2: MINIMUM PAYMENT: The minimum payment per call at any individual job sites or various job sites during the same day will be eight hundred dollars (\$800.00).

Note 3: All payments shall be made as described in paragraph 1.09 herein.

Note 4: WORKING HIGHER THAN 12 FEET ABOVE FLOOR LEVEL OR WORK REQUIRING COMPLEX SCAFFOLDING OR CONSTRUCTION WORK PLATFORMS: Provisions are made in this Contract to compensate the Asbestos abatement contractor for work performed in locations that are difficult to access due to work at elevations that are significantly higher than the normal work level. The unit price for these items will be paid at 1.20 times the unit price described in Paragraphs 1.09, A through R for those portions of the work that are more than twelve (12) feet above the grade for that would be judged as the normal working level.

1.10 GUARANTEE

- A. Work performed in compliance with each task shall be guaranteed for a period of one year from the date the completed work is accepted by the Department of Design and Construction.
- B. The Commissioner of The Department of Design and Construction will notify the Asbestos abatement contractor in writing regarding defects in work under the guarantee.

1.11 OCCUPANCY OF SITE NOT EXCLUSIVE

Attention is specifically drawn to the fact that contractors, performing the work of other Contracts, may be brought upon any of the work sites of this Contract. Therefore, the Asbestos abatement contractor shall not have exclusive rights to any site of his work and shall fully cooperate and coordinate his work with the work of other contractors who may

be brought upon any site of the work of this Contract. This paragraph applies to those areas outside the regulated Work Area as defined by Title 15, Chapter I of RCNY.

1.12 SUBMITTALS

A. Pre-Construction Submittals:

1. Attend a pre-construction meeting scheduled by the City of New York Department of Design and Construction. This meeting shall also be attended by a designated representative of the City of New York third party air monitoring firm, facility manager and the Construction Project Manager. At this meeting, the Asbestos abatement contractor shall present three copies of the following items:

a. Asbestos abatement contractor's scope of work, work plan and schedule.

b. Asbestos project notifications, approved variances and plans to Government Agencies.

c. Copies of Permits, clearance and licenses if required.

d. Schedules: the Asbestos abatement contractor shall provide to the Construction Project Manager a copy of the following schedules for approval. Once approved, schedules shall be maintained and updated as received. Asbestos abatement contractor shall post a copy of all schedules at the site:

(1) A construction schedule stating critical dates of the project including, but not limited to, mobilization, Work Area preparation, demolition, gross removal, fine cleaning, encapsulation, inspections, clearance monitoring, and phase of refinishing and final inspections. The schedule shall be updated biweekly, at a minimum.

(2) A schedule of staffing stating number of workers per shift per activity, name and number of supervisor(s) per shift, shifts per day, and total days to be worked.

(3) Submit all changes in schedule or staffing to the Construction Project Manager prior to implementation.

e. Written description of emergency procedures to be followed in case of injury or fire. This section must include evacuation procedures, source of medical assistance (name and telephone number to nearest

hospital) and procedures to be used for access by medical personnel (examples: first aid squad and physician). NOTE: Necessary Emergency Procedures Shall Take Priority Over All Other Requirements of These Specifications.

- f. Material Safety Data Sheets (MSDS) for encapsulants, sealants, firestopping foam, cleaners/disinfectants, spray adhesive and any and all potentially hazardous materials that may be employed on the project. No work involving the aforementioned will be allowed to proceed until MSDS are reviewed.
- g. Worker Training and Medical Surveillance: The Asbestos abatement contractor shall submit a list of the persons who will be employed by him /her to perform the removal work. Present evidence that workers have received proper training required by the regulations and the medical examinations required by OSHA 29 CFR 1926.1101.
- h. Logs: Specimen copies of daily progress log, visitor's log, and disposal log.
 - (1) The Asbestos abatement contractor shall provide a permanently bound log book of minimum 8-1/2" x 11" size at the entrance to the Worker and Waste Decontamination enclosure system as hereinafter specified. Log book shall contain on title page the project name, name, address and phone number of the Asbestos abatement contractor; name, address and phone number of Asbestos abatement contractor and City's third party air monitoring firm; emergency numbers including, but not limited to local Fire/Rescue Department. Log book shall contain a list of personnel approved for entry into the Work Area.
 - (2) All entries into the log shall be made in non-washable, permanent ink and such pen shall be strung to or otherwise attached to the log to prevent removal from the log-in area. Under no circumstances shall pencil entries be permitted. Any significant events occurring during the abatement project shall be entered into the log. Upon completion of the job, the Asbestos abatement contractor shall submit the logbook containing a day-to-day record of personnel log entries countersigned by the Construction Project Manager every day.
- i. Worker's Acknowledgments: Submit statements signed by each employee that the employee has received training in the proper handling of ACM, understands the health implications and risks

involved; and understands the use and limitations of the respiratory equipment to be used.

B. During Construction Submittals:

1. Security and safety logs showing names of person entering workspace, date and time of entry and exit, record of any accident, emergency evacuation, and any other safety and/or health incident.
2. Progress logs showing the number of workers, supervisors, hours of work and tasks completed shall be submitted daily to the Construction Project Manager.
3. Floor plans indicating Asbestos abatement contractor's current work progress shall be submitted for review by the Construction Project Manager.
4. All Asbestos abatement contractors' air monitoring and inspection results.

C. Project Closeout Submittals:

Upon completion of the project and as a condition of acceptance, the Asbestos abatement contractor shall present two copies of the following items, bound and indexed:

1. Lien Waivers from Asbestos abatement contractor, Sub-Asbestos abatement contractors and Suppliers,
2. Daily OSHA air monitoring results,
3. All Waste Manifests (Asbestos and Construction Debris), seals and disposal logs,
4. Field Sign-In/Sign-Out Logs for every shift,
5. Copies of all Building Department Forms and Permits,
6. A Letter of Compliance stating that all the work on this project was performed in accordance with the Specifications and all applicable Federal, State and Local regulations,
7. All Warranties as stated in the Specifications,
 - a. Fully executed disposal certificates and transportation manifest.
8. Project Record: The Asbestos abatement contractor shall maintain a project record for all small and large asbestos projects. During the project, the

project record shall be kept on site at all times. Upon completion of the project, the project record shall be maintained by the building owner. The project record shall be submitted to DDC as part of the close out documents. The project record shall consist of:

- a. Copies of licenses of all asbestos abatement contractors involved in the project;
- b. Copies of NYCDEP and NYSDOL supervisor and handler certificates for all workers engaged in the project;
- c. Copies of all project notifications and reports filed with NYCDEP, NYSDOL and USEPA for the project, with any amendments or variances;
- d. Copies of all asbestos abatement permits, including associated approved plans and work place safety plan;
- e. A copy of the air sampling log and all air sampling results;
- f. A copy of the abatement asbestos abatement contractor's daily log book;
- g. Copies of all asbestos waste manifests;
- h. A copy of all Project Monitor's Reports (ACP-15).
- i. A copy of each ATR-1 Form completed for the asbestos project (if required).
- j. A copy of each Asbestos Project Conditional Closeout Report (ACP-20) if required.
- k. A copy of the Asbestos Project Completion Form (ACP-21).

1.13 PROTECTION OF FURNITURE AND EQUIPMENT

Cover all furniture and equipment that cannot be removed from Work Areas. Movable furniture and equipment will be removed from Work Areas by the Asbestos abatement contractor prior to start of work. At the conclusion of the work (after final air testing), the Asbestos abatement contractor will remove all plastic covering on walls, floors, furniture, equipment and reinstall furniture and equipment. He shall remove and store all sheaths, curtains and drapes, and reinstall same following final clean up.

1.14 UTILITIES

A. General:

All temporary facilities shall be subject to the approval of the Commissioner. Prior to starting work at any site, locations and/or sketches (if required) of temporary facilities must be submitted to the Construction Project Manager for the required approval.

B. Water:

The Department of Design and Construction will furnish all water needed for construction, at no cost to the Asbestos abatement contractor in buildings under their jurisdiction. However, it is the responsibility of the Asbestos abatement contractor to ensure that hot water is provided for showering in the decontamination unit. The Asbestos abatement contractor shall furnish, install and maintain any needed equipment to meet these requirements at his own expense.

C. Electricity:

The Department of Design and Construction will furnish all electricity needed for construction, at no cost to the Asbestos abatement contractor in a building, under their jurisdiction. The Asbestos abatement contractor is responsible for routing the electric power to the abatement Work Area.

All temporary lighting and temporary electrical service for Work Area shall be in weatherproof enclosures and be ground fault protected.

D. In leased spaces, arrangements for water supplies and electricity must be made with the landlord. However, all such arrangements must be made through and are subject to approval of the Department of Design and Construction. Utilities will be provided at no cost to the Asbestos abatement contractor. However, it is the Asbestos abatement contractor's (or the Electrical contractor's) responsibility to furnish and install a suitable distribution system to the Work Area. This system will be provided at no cost to the City.

1.15 FEES

The Asbestos abatement contractor shall be responsible for any and all fees or charges imposed by Local, State or Federal Law, Rule and Regulation applicable to the work specified herein, including fees or charges which may be imposed subsequent to the date of the Bid opening.

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SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Specifications and Contract Drawings shall form part of the Contract Documents. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Where General and Supplement Conditions and General Requirements clauses are repeated in these Specifications, it is to call special attention to them, or as a further qualification. No General and Supplement Conditions and/or General Requirements clause referring to the work of this Section shall be considered waived unless specifically stated herein.
- C. Unless otherwise shown on the Contract Drawings, or unless otherwise specified in other Sections of these Specifications, the requirements specified in this Section are applicable to all electrical work of this Contract. Additional requirements applicable to individual Sections of these Specifications are specified in those Sections, or are shown on the Contract Drawings.

1.2 SUMMARY

- A. Provide all labor, materials, supplies, tools, machinery, equipment, scaffolding, transportation, rigging, storage, utilities, supervision and required permits and licenses necessary to complete the electrical work under this contract.
- B. Provide a complete working electrical installation with all equipment called for in proper operating condition. Documents do not undertake to show or list every item to be provided. When an item not shown or listed is clearly necessary for proper operation of equipment that is shown or listed, provide the item, which will allow the system to function properly at no increase in Contract Price.
- C. Coordinate the electrical work with the work of the other trades to resolve conflicts without impeding job progress or the construction schedule.
- D. Examine all Contract Documents including those of other trades in order to determine the extent of the Work required to be completed under this Section. Failure to examine all Contract Documents for this project will not relieve this contractor of the responsibility to perform all the Work required for a complete, fully operational and satisfactory installation.
- E. Bidders are deemed aware, based on the background and experience, of materials, which may be required in the discharge of their responsibilities, even though unspecified. Claims for extras for unspecified shoring or supporting materials will not be considered if the need for such materials would have been reasonably obvious to the bidders skilled and experienced in the work to be done and the submittal of a bid shall be deemed a waiver of any such claims.
- F. Provide notice with bid proposal of any concrete or structural work required by this Section that is not indicated on the Structural or Architectural Drawings.

1.3 DEFINITIONS

- A. "Architect": the Architect of record.
- B. "Engineer": the Engineer of record.
- C. "Contractor": the individual, partnership or corporation to whom the Contract for the Electrical work has been awarded.
- D. "Provide": Shall mean furnish and install.
- E. "Furnish": to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories, and all other items customarily required for the proper and complete application.
- F. "Install": to join; unite; fasten; link; attach; set up or otherwise connect together; complete, tested, and ready for normal satisfactory operation.
- G. "As Directed": as directed by the Commissioner.
- H. "Submit": submit to the Commissioner for review.
- I. "Finished Spaces" Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- J. "Exposed, Interior Installations" Exposed to view indoors. Examples include finished occupied spaces and electrical equipment rooms.
- K. "Exposed, Exterior Installations" Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include equipment yards or rooftop locations.
- L. "Concealed, Interior Installations" Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in wall conduits.
- M. "Concealed, Exterior Installations" Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- N. "Connect": Shall mean make final electrical connections for a complete operating piece of equipment.
- O. "Equal": Shall be of the same quality, appearance and utility to that specified, as determined by the City of New York's Representative. Contractor bears the burden of proof of equality.
- P. "Electrical Work": The installation, alteration, maintenance, or repair of electric wires and wiring apparatus and other appliances used or to be used for the transmission of electricity for electric light, heat, power, signaling, communication, alarm or data transmission.

1.4 CODES, STANDARDS, FILING AND PERMITS

- A. The Electrical installation shall comply with the latest revised versions of all applicable laws, rules, regulations, standards, codes and ordinances of the federal, state and local authorities

having jurisdiction and other requirements specified in other Specifications and Contract Drawings.

- B. If any of the provisions of the laws, rules, regulations, standards, codes, ordinances and requirements of the Contract Drawings or Specifications is in conflict with one another, the most stringent requirements shall govern.
- C. All materials and equipment, materials and methods shall comply with all applicable requirements of laws, codes, ordinances, legislations, etc., of all federal, state and local authorities whether listed on the contract documents or not.
- D. Obtain the required permits from the local authorities for this work and pay for all fees required by the local, State, and Federal authorities for permits, inspections and review, including special agency construction and operating permits. Make corrections in the work as required by the City of New York's Representative or Inspector to pass all such regulations.
- E. All equipment and materials shall be approved for use in New York City and listed with MEA numbers. Submit MEA number for all equipment during the submittal process.
- F. The Contractor shall be responsible for filing drawings, inspection arrangement with authorities having jurisdiction, and obtaining approval from N.Y.C Advisory Board, New York City Fire Department and Con Edison. The Contractor shall be responsible for all related fees.

1.5 REFERENCES

- A. Work shall be performed in accordance with all applicable requirements of the listed edition of all governing codes, rules, standards and regulations including but not limited to the following codes and standards, whether listed or not:
 - 1. American Concrete Institute (ACI)
 - 2. American with Disabilities Acts (ADA)
 - 3. American National Standards Institute (ANSI)
 - 4. American Society for Testing Materials (ASTM)
 - 5. Electrical Industries Association/Telecommunication Industries Association (EIA/TIA)
 - 6. Environmental Protection Agency (EPA)
 - 7. Electrical Testing Laboratories (ETL)
 - 8. Federal Aviation Administration (FAA)
 - 9. Factory Mutual (FM)
 - 10. Illuminating Engineering Society (IES)
 - 11. Institute of Electrical and Electronics Engineers (IEEE).
 - 12. National Electrical Manufacturer's Association (NEMA)
 - 13. National Fire Protection Association (NFPA)
 - 14. National Electrical Testing Association (NETA)
 - 15. National Electrical Code (NFPA-70)
 - 16. NYC Amendments to the 2005 NEC
 - 17. New York City Building Code (NYCBC)
 - 18. New York City Fire Code
 - 19. New York City Electric Code Advisory Board
 - 20. NYC Electrical Code Revision and Interpretation Committee (E.C.R.I.C.)
 - 21. New York City Electrical Code (NYCEC)
 - 22. New York City Seismic Code (NYCSC)
 - 23. Energy Conservation Construction Code of New York State (ECCCNYS)
 - 24. Occupational Safety and Health Administration (OSHA)
 - 25. Underwriters' Laboratories (UL)

1.6 WORK INCLUDED

- A. This section supplements all Sections of this Division and shall apply to all phases of Work specified, indicated in the Contract Documents, and as required to provide for a complete installation of electrical systems for the Project.
1. Electric service switchboards, switchgears and utility metering provisions.
 2. Switchboards, Switchgears, Distribution, and panelboards for lighting and power.
 3. Feeders, bus way, sub feeders, and branch circuiting for light, power and control wiring, including connections to all service switchboards, distribution switchboards, transfer switches, panelboards, transformers, motor control centers, motor starter groups, motor control equipment, disconnect devices, outlets, motors and equipment included in these Specifications or indicated on contract drawings.
 4. Furnishing and installation of lighting equipment, lighting fixtures, lamps, contactors, lighting control systems, etc.
 5. Life safety devices, wiring and interface with the building automation system, in accordance with the provisions of New York City Local Law No. 5, Local Law No. 16 and Local Law No. 58.
 6. A complete electrical grounding system.
 7. Installation and testing of the standby/emergency power system, including control wiring connections and testing of automatic transfer switches.
 8. Labor and/or standby assistance in commissioning the control and instrumentation systems provided with Building Automation and Temperature Controls Section of the Specification.
 9. Connection of all motors, equipment, interlocks, safety devices, and other components as indicated on the Drawings, including all motor controllers.
 10. Power and empty raceway system for the security system components (refer to Security Consultant's drawings and specifications).
 11. Conduit, raceways, ladder racks, sleeves, etc., for the telecommunication systems.
 12. Power and empty raceway system for the Audio Visual system (Refer to Audio Visual drawings and specifications).
 13. Connection of all equipment furnished under other Divisions and/or by the City of New York.
 14. Remove the protective coverings on the lighting fixtures when required by the heating, ventilating and air conditioning air-balancing contractor.
 15. Provide all excavation and back-fill required for Division 26 Work.
 16. Equipment supports, vibration isolation and seismic restraint devices.
 17. Furnish and set all sleeves, complete with seals and firestop for the passage of conduit, etc. through structural steel, decking, masonry and concrete walls and floors, drywall construction, any other rated construction assembly, and elsewhere as will be required for the proper protection of each raceway and busduct passing through a wall, floor, etc.
 18. Complete all tests required by all rules, regulations, etc. of all authorities having jurisdiction and prepare, complete and file all forms, tabulations, plans, etc., including Controlled Inspections, pertinent thereto with the referenced authorities and accomplish such work with personnel of proper caliber, in particular Professional Engineers, where so required.
 19. Participate in and provide labor for "off hour" testing of equipment and systems as required by working conditions or by the Authorities Having Jurisdiction to obtain all "Temporary Certificate of Occupancy (TCO)" and final "Certificate of Occupancy".
- B. Related work: Consult all other Sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable installation.

1. General and supplementary conditions: Drawings and general provisions of Contract and Division 1 DDC General Conditions of the Specifications, apply to all Division 26 Sections.
2. Earthwork: Include trenching, backfilling, boring and soil compaction as required for the installation of underground conduit, in-grade pull boxes, vaults, lighting pole foundations, etc.
3. Concrete work: Include forming, steel bar reinforcing, cast-in-place concrete, finishing and grouting as required for underground conduit encasement, light pole foundations, pull box slabs, vaults, housekeeping pads, etc.
4. Miscellaneous metal work: Include fittings, brackets, backing, supports, rods, welding and pipe as required for support and bracing of raceways, lighting fixtures, panelboards, distribution boards, switchboards, motor control centers, etc.
5. Moisture protection and smoke barrier penetrations: Include membrane clamps, sheet metal flashing, counter flashing, caulking and sealant as required for waterproofing of conduit penetrations and sealing penetrations in or through fire walls, floors, ceiling slabs and foundation walls. All penetrations through vapor barriers at slabs on grade shall be taped and made vaportight.
6. Access panels and doors: Required in walls, ceilings, and floors to provide access to electrical devices and equipment.
7. Painting: Include surface preparation, priming and finish coating as required for electrical cabinets, exposed conduit, pull and junction boxes, etc. where indicated as field painted in this Division.

1.7 SUBMITTALS

- A. Furnish quantities of each submittal as noted in Division 1 DDC General Conditions or individual division 26 sections. Submit calculations where required by the Specifications or the Contract Drawings.
1. Within the agreed upon time period but no later than three weeks after award of the Contract, the Contractor shall submit for the Commissioner's review, a list of the manufacturers products and services he proposes to use for the work.
 2. Within the agreed upon time period but no less than six weeks after award of the Contract, the Contractor shall submit a schedule listing all shop drawings and samples with the projected date that each item will be submitted to the Commissioner for review.

Shop Drawings

3. Format: Furnish submittal data neatly bound in an 8-1/2" x 11" folder or binder for each Specification Section with a table of contents listing materials by Section and paragraph number. All symbols and designations used in preparing Record and Coordination Drawings shall match those used in the Contract Drawings.
4. Each shall bear a stamp stating that the submittal has been thoroughly reviewed by the Contractor and is in full compliance with the requirements of the Contract Documents. Cover letters shall list in full the items and data submitted. Failure to comply with this requirement shall constitute grounds for rejection of data.
5. Submittals shall consist of detailed shop drawings, specifications, block wiring diagrams, "catalog cuts" and data sheets containing physical and dimensional information, performance data, electrical characteristics, materials used in fabrication, and material finish. Clearly indicate by arrows or brackets precisely what is being submitted on and those optional accessories which are included and those which are excluded. NEMA references, IEEE Standard, MEA number are required.
6. The Contractor shall submit detailed drawings of all electrical equipment rooms, yards and utility areas. Physical size of electrical equipment shown on the drawings shall

- match those of the electrical equipment that is being submitted for review, i.e.: switchboards, panelboards, transformers, control panels, etc. Minimum scale: 3/8" = 1'-0". Revised electrical equipment layouts must be reviewed prior to release of order for equipment and prior to installation.
7. Shop drawings for manufactured material and equipment shall include model numbers, dimensioned drawings, operating weights, material specifications, operating features and controls wiring diagrams, performance characteristics, service procedures, including clearance requirements for maintenance work, and conformance to specified Codes and standards. Note that in addition to these requirements, other specific submittal data, and forms of data submission, are required by the Contract Documents for particular items of equipment and material.
 8. Shop drawings for Switchboard Rooms, electric closets, and for conduit and similar distribution services shall show by dimension the exact size and location of each element of the system in both the horizontal and vertical plane, as well as relationship to the building structure, architectural construction, equipment, and the work of other Trades. Shop drawings shall clearly show where doors providing access to equipment will be required in finished construction. Pads, foundations, anchorages, supports and attachments to the building structure, where required for the installation of the work shall be shown in layout and detail with sizes, dimensions, materials and methods of construction noted. The work described in any shop drawing submission shall be carefully checked by this Contractor for all clearances, including those required for maintenance, servicing equipment removal, field conditions, maintenance of architectural conditions and proper coordination with all Trades on the job. Each submitted shop drawing shall include a certification by the Contractor that all related job conditions have been checked and that no conflict exists. No shop drawing submission will be reviewed without such certification.
 9. Samples shall be identical in all respects to the material which is to be installed or applied in the execution of the work, and shall be of sufficient size or quantity to permit proper evaluation and review. Manufacturer's descriptive labels and printed application instructions, which are normally attached to the material or its packaging, shall be furnished with the sample. Samples shall be submitted for review when requested by the Commissioner.
 10. Submit detail designs for seismic restraint and support for conduits and equipment. The designs shall be certified and sealed by a Professional Engineer licensed in the State in which the work is to be performed.
 11. The manufacturer shall recommend the method of anchoring the equipment to the mounting surface and shall provide the Contractor with the assembly dimensions, weights and approximate centers of gravity.
 12. All re-submittals shall include a cover letter that lists the action taken and revisions made to every drawing and equipment data sheet in response to Submittal Review Comments. Re-submittal packages will not be reviewed unless accompanied by this cover letter. Failure to include this cover letter will constitute rejection of the re-submittal package.
 13. While the Contractor shall have access to neither the Commissioner's drawings, neither the Commissioner's drawings nor electronic files nor any other reproduced copy of the Commissioner's drawings at any scale shall be used by the Contractor to generate any shop drawings. Shop drawings shall be completely drawn at the appropriate scale by this Contractor for any purpose on the project.
 14. No part of the work shall be started in the shop or in the field until the Commissioner has reviewed the shop drawings and samples for that portion of the work and provided the approval required. Thereafter, the work shall be executed in accordance with the Contract Documents and the indicated status of the reviewed shop drawing.

Substitutions:

15. Proposed substitutions for material and equipment required by the Contract Documents shall be submitted to the Commissioner for review at the time when the Contractor submit list of the manufacturers whose products and services he proposes to use for the work. After the expiration of this period, substitutions for material or equipment shall not be proposed or requested in shop drawing and sample submittals, and the Contractor will be required to execute the work in accordance with the provisions of the Contract Documents.
16. Where items are noted as "or equal," a product of equal design, construction and performance will be considered. Contractor must submit all pertinent test data, catalog cuts and product information required substantiating that the product is in fact equal to that specified. Only one substitution will be considered for each product specified.
17. Manufacturers' names and model numbers used in conjunction with materials, processes or equipment included in the Contract Documents are used to establish standards of quality, utility and appearance. Materials, processes or equipment, which, in the opinion of the City of New York's Representative, is equal in quality, utility and appearance, will be approved as substitutions to that specified.
18. Whenever any material, process or equipment is specified in accordance with a Federal specification, ASTM standard, ANSI specification, UL listing or other association standard, the Contractor shall present an affidavit from the manufacturer certifying that the product complies with the particular standard specification. When requested by the City of New York's Representative, support test data to substantiate compliance shall be submitted by the Contractor at no additional cost.
19. Submittals proposing or requesting substitutions shall be expressly identified as such in a letter of transmittal, with the reasons for requesting the substitution stated and a clear table of comparison listing pertinent features of both first named and proposed materials including material of construction, overall length, width, height dimensions, space required for tube replacement or maintenance access, motor type, horsepower, voltage, phase service factor, noise levels and performance data. Review of proposed substitution will not be made until receipt of satisfactory comparison tabulation.
20. Substitutions shall be equal, in the opinion of the City of New York's Representative, to the specified product. The burden of proof of such shall rest with the Contractor. When the City of New York's Representative, in writing, accepts a substitution, it is with the understanding that the Contractor guaranteed the substituted article or material to be equal to the one specified and dimensioned to fit within the construction. Approved substitutions shall not relieve the Contractor of responsibilities for the proper execution of the work, or from any provisions of the Specifications.
21. The Contractor shall be responsible for all expenses in connection with the substitution materials, processes and equipment, including the effect of his substitution on him, his subcontractor's or other Contractor's work. Any additional work required by other trades as a result of a substitution shall be covered under this Contract. Submittals for this purpose shall be complete in every respect, shall conform to all the information requirements for shop drawing and sample submittals, and shall include, at no cost, the necessary revisions to other related work required by the Contract Documents
22. No substitution of material, processes or equipment shall be permitted without written authorization of the City of New York's Representative. Any assumptions on the acceptability of a proposed substitution prior to acceptance by the City of New York's Representative are at the sole risk of the Contractor.

Coordination Drawings

23. The Contractor shall produce a complete set of the "Coordination Drawings" showing electrical, mechanical, plumbing, fire protection, structural and architectural for the project.
24. The Drawings shall indicate the equipment actually purchased and the exact location of the equipment, the exact routing and elevations for all lines such as piping, busway,

- conduit, ductwork, etc. All dimensions shall be referenced to building structural centerlines.
25. All Contract Drawing space allocations shall be maintained, such as ceiling height, chase walls, equipment room size, etc., unless prior written authorization is received from the Commissioner to change them.
 26. The Drawing preparation and completion shall comply with the requirements of the project construction schedule.
 27. The plan drawings, prepared on electronic media (CAD) at a scale not less than 3/8 in. equal to 1 ft., shall serve as the base drawings to which all other Contractors will overlay and add their work. Each trade shall draw their work on separate layers represented by individual colors.
 28. The Contractor's "Coordination Drawings" indicating piping, conduit, busway, and equipment support points and loads exceeding 500 lb. imposed on the building structure shall be submitted to the Commissioner for review and approval. The elevation, location, support points, static, dynamic and expansion forces and loads imposed on the structure at support, and anchor points, and the size of all lines shall be indicated.
 29. All beam penetrations and slab penetrations shall be indicated and sized and shall be coordinated. All work routed underground or embedded in concrete shall be indicated by dimension to column and building lines and shall be coordinated. This requirement for "Coordination Drawings" shall not be construed as authorization for the Contractor to make any unauthorized changes to the Contract Drawings.
 30. Prepare large scale detailed layout Drawings showing locations of equipment, conduit runs, panels, and all other elements of electrical systems where required by other Sections of this Division, plus sections of all congested areas to show relative position and spacing of affected elements. All symbols and designations used in preparing Record Drawings shall match those used in Contract Drawings.
 31. The Work shall be installed in accordance with the shop drawings and the "Coordination Drawings". If the Contractor allows one trade to install their work before coordinating with the work of other trades, the Contractor shall make necessary changes to correct the condition without extra cost to the City of New York.
 32. Prior to final acceptance of the work of this Division, the Contractor shall give the two (2) copies of the drawing files, in AutoCAD on "CD format and two (2) hard-copy of the drawings, one (1) of which shall be furnished on wash-off Mylar transparencies on heavy gauge film and one (1) of which shall be on paper containing the Contractor's coordination documentation to the City of New York.
 33. Each "Coordination Drawing" shall be completed and signed off by the other Contractors and this Contractor prior to the installation of the work in the area covered by the specific coordination drawing.

Record Drawings

34. The Contractor shall maintain on a daily basis at the Project site a complete set of "Record Drawings". The "Record Drawings" shall consist of a set of blue-line prints and AutoCAD files of the Contractor Coordination Drawings for this Section. The prints shall include the updated AutoCAD files, which shall be periodically electronically updated to show the precise location of all buried or concealed work and equipment, including embedded piping and valves, and all changes and deviations in the Electrical work from that shown on the Contract Documents. This requirement shall not be construed as authorization for the Contractor to make changes in the layout or work without written definite instructions from the Commissioner.
35. Dimensions shall clearly and accurately delineate the work as installed; locations shall be suitably identified by at least two dimensions to permanent structures.
36. Upon completion of the Work, the Contractor and his Subcontractors shall certify all "Record Drawings" on the front lower right hand corner adjacent to the above marking

with a rubber stamp impression or an AutoCAD image that states the Project name, the Contractor's name, the area covered and the date.

37. Prior to final acceptance of the Work of this Section, the Contractor shall submit properly certified "Record Drawings" to the Commissioner for review and shall make changes, corrections, or additions as the Commissioner may require to the "Record Drawings". After the Commissioner's review, and any required Contractor revisions, the "Record Drawings" shall be delivered to the Construction Manager on CD format in AutoCAD format for the City of New York's use.

B. Prior to Final Acceptance, the following data shall be furnished to the City of New York.

1. Manufacturer's Data of the equipment and devices installed.
2. Coordination Drawings
3. Record Drawings.
4. Operation and Maintenance Manuals

1.8 QUALITY ASSURANCE

- A. All workers performing under this Division shall be skilled workers of the trade involved. Where specialty work, such as splicing or welding are required, submit proof of training, experience and work history for each worker, for review by the Commissioner. Only approved workers shall perform specialty work.
- B. All electrical work shall be performed by an electrical contractor licensed in the state, which the work is to be performed.
- C. All electrical materials and equipment for which there is a nationally recognized standard shall bear the conformance labeling of the third party inspection authority, such as Underwriters Laboratories Inc., Factory Mutual, ETL or other recognized agency listed, in accordance with the requirements of the local Authority having jurisdiction.
- D. Carcinogenic material, including Asbestos shall not be furnished or installed.
- E. All calculations required by this and other various Sections of these Specifications, or as shown on the Drawings, shall be certified and sealed by a Professional Engineer licensed in the state in which the work is to be performed, and shall be submitted to the Commissioner for review.
- F. With the exceptions as specified and/or indicated on the Drawings or in the Specifications, the Contractor shall apply, install, connect, erect, use, clean, commission and condition manufactured articles, materials, and equipment per Manufacturer's current printed instructions and recommendations. Copies of such printed recommendations shall be kept at the Project site and made available as required.
- G. Where the manufacturer's recommendations conflict with the Contract Documents, the conflict shall be brought to the Commissioner's attention immediately.

1.9 GUARANTEE

- A. Submit a single guarantee stating that all portions of the work are in accordance with Contract Documents. Warrant all work against faulty and improper material and workmanship for a period of one year from date of substantial completion and/or acceptance, except that where guarantees or warranties for longer terms are specified herein, such longer term shall apply. At no additional cost to City of New York, within 24 hours after notification, correct any

deficiencies, which occur during the warranty period (including all parts, material, labor, etc.), all to the satisfaction of the City of New York or his designated representative. In default thereof, the City of New York may have such work done and charge all costs to the Contractor. This Contractor shall require similar guarantees from his Subcontractors.

- B. During the warranty period, the Contractor shall guarantee the following in a form satisfactory to the City of New York:
- C. All equipment meets the design capacities and performance characteristics specified.
- D. The systems shall operate without malfunction.
- E. The start of the Contractor's warranty period shall commence on the issue of a "Certificate of Substantial Completion", by the City of New York or the City of New York's Representative for each item of material, equipment, or system.
- F. Warrant that all components, subsystems and systems will perform their specified functions from the date of turnover and commercial operation through the useful life of the system. In the event components fail for any reason, be responsible to repair, replace and reimburse the City of New York for all costs associated with the component, subsystem or system that failed to perform the specified function.

1.10 SCHEDULING

- A. The following is a summary of the scheduling milestones described in the text of the Specifications. The Contractor shall start on or schedule the following upon receiving notice to proceed.
- B. Immediately upon award of this Contract, this Contractor shall have a pre-construction meeting with the Commissioner.
- C. On or before three (3) weeks after notice to proceed, submit a complete, typed list of the subcontractors, equipment manufacturers and suppliers they intend to use to the Commissioner for review.
- D. On or before six (6) weeks after notice to proceed, prepare an index of all his Electrical shop drawings and brochures for the Project.
- E. As requested by the Construction Manager, the Contractor shall submit "Coordination Drawings" to the Commissioner for review.
- F. As requested by the Construction Manager, the Contractor shall provide a detailed schedule of completion indicating when each system is to be completed and outlining when tests will be performed.
- G. Submit proposed test procedures, recording forms and test equipment for review by the Commissioner prior to execution of testing.
- H. Submit six (6) final copies of the Operation and Maintenance books to the City of New York for review at least ten (10) weeks before Final Review of the Project.
- I. Submit three (3) final copies of the Record Set to the City of New York for review at least four (4) weeks before Final Review of the Project.

1.11 DRAWINGS AND COORDINATION WITH OTHER TRADES

A. Contract Drawings

1. Drawings are essentially diagrammatic, intended to convey the scope of work and to indicate the desired location or arrangement of equipment, devices, and conduit runs, outlets, etc. are to be followed as closely as possible. Judgment must be exercised in executing the Work to secure the best possible installation in the available space and to overcome local difficulties due to space limitation or interference with structural conditions.
2. Drawings indicate, diagrammatically, the routes of duct banks and conduit system, unless specifically dimensioned, and do not indicate the required pull boxes, cable support boxes, fittings, seismic restraint, supports or similar items required for a complete system
3. Exact routing of wiring and locations of outlets, panels, equipment, devices, luminaries, etc., shall be governed by structural conditions, obstructions and existing conditions. Commissioner reserves right, at no increase in cost, to make any reasonable change in locations of electrical items, exposed at ceiling and/or on walls, to group them into orderly relationships and/or increase their utility.
4. The Contractor shall follow the Drawings in laying out the Work and check drawings of all trades to verify spaces in which Work will be installed. Maintain maximum headroom in all areas. Where space conditions appear inadequate, the Commissioner shall be notified before proceeding with the installation.
5. Certain materials will be furnished, installed, or furnished and installed, under other Sections of the Contract Documents. Examine the Contract Documents to ascertain these requirements
6. Where variance occurs between the Drawings and Specifications or within either document itself, the items or arrangement of better quality, greater quantity, or higher cost shall be included in the contract price. The Contractor shall request clarification in writing from the Commissioner on which item and manner in which the Work shall be installed.
7. The equipment selections used in the preparation of the Contract Documents will fit into the physical spaces provided and indicated, allowing room for access, servicing, removal and replacement of parts, etc. Adequate space shall be allowed for clearance in accordance with Code requirements, the requirements of the Local Authorities Having Jurisdiction, and the equipment manufacturer's recommendations.
8. In the preparation of Drawings, a reasonable effort to accommodate acceptable equipment manufacturer's space requirements has been made. However, since space requirements and equipment arrangement vary according to each manufacturer, the responsibility for initial access, maintenance access, code required access, and proper fit rests with the Contractor. Other specified manufacturers of this equipment will be acceptable contingent on the Contractor providing a complete installation and maintaining full responsibility to provide, at no additional cost, any modifications to the structure or electrical service that are required to properly install, operate, and service the equipment. These modifications shall not include additional area for the equipment unless approved by the Commissioner.
9. Locations shown on Architectural Reflected Ceiling Drawings, Architectural Floor Plans or on wall elevations shall take precedence over electrical plan locations. For roughing out devices, the Contractor shall refer to the Architectural Drawings.

B. Coordination:

1. Work out all "tight" conditions involving Work under this Division and Work in other Divisions in advance of installation. If necessary, and before Work proceeds in these areas, prepare supplementary Drawings under this Division for review, showing all Work

- in "tight" area. Provide supplementary Drawings and additional Work necessary to overcome "tight" conditions.
2. Carefully check space requirements with other Sections of the Contract Documents to insure that all material can be installed in the spaces allotted thereto.
 3. Transmit to other trades information required for work to be provided under other Sections such as space for access to pull boxes, cable support boxes, control wiring and connections, access doors in ample time for installation.
 4. The Construction Manager and all Trades shall coordinate the installation of equipment, conduit, busduct, ductwork, piping, cable, cable trays, etc., with the installation of luminaries, special ceiling construction, air distribution equipment and the structure. Provide additional rises, drops, offsets and pullboxes as required. If, after installed, new conduit, busduct, ductwork, piping or cable is found to be in conflict with the architecture, structure, or other trade Work which is either existing or shown on the Contract Documents, the conduit, busduct, ductwork, piping or cable shall be relocated without additional cost to the City of New York
 5. Wherever work interconnects with work of other Sections, coordinate this work to insure that other Sections are advised of the information necessary so that they may properly install all the necessary connections and equipment. Identify all work items in an approved manner in order that the work of other Sections may know where to install access doors and panels.
 6. Furnish and set all sleeves for passage of the electrical service and distribution, and telecommunication services through structural masonry and concrete walls and floors and elsewhere as will be required for the proper protection of each conduit passing through building surfaces. Coordinate this work with the Construction Manager in order to properly expedite and perform this work and provide fireproofing in accordance with these Contract Documents.
 7. A planned sequence of operation is required to properly install the complete systems. It shall be the responsibility of this Section to coordinate, protect and schedule its work with other Sections in accordance with the construction sequence.
 8. Architectural drawings shall be checked for ceiling height requirements. Where no ceiling height is stated, request direction from Commissioner prior to commencing work.
 9. Field drilling, cutting and/or reinforcing of holes in structural metal deck required for work under this Section shall be coordinated through the Construction Manager and approved by the Structural Engineer. All such drilling, cutting and reinforcing costs shall be included as work of this Section of the Contract Documents.
 10. Differences or disputes concerning coordination, interference or extent of Work between Divisions shall be decided by Commissioner. The Commissioner's decision, if consistent with Contract Documents requirements, shall be final.
 11. Coordinate electrical power and control wiring requirements for mechanical equipment connections with Division 23.
 12. Equipment rough-in locations shown on the Drawings for equipment furnished by City of New York and for equipment furnished under other Divisions are approximate only. Obtain exact rough-in locations from following sources:
 - a. From shop drawings for Contractor-furnished and installed equipment.
 - b. From Commissioner for City of New York-furnished Contractor-installed equipment.
 13. Where conflict exists between rough-in shown on drawings and that shown or required by equipment to be installed, obtain clarification from Commissioner and provide rough-in as directed.
 14. Provide templates, information and instructions to other Divisions to properly locate holes and openings to be cut or provided for the Work.
 15. The Contractor shall cooperate and confer with other trades as to locations of their materials and equipment before erecting work, to avoid interference as much as possible, and in such a manner that will in no way retard progress of construction. In the event that interferences develop, the Commissioner's or City of New York's decision will be final as

- to which Division shall relocate its work, and no additional compensation will be allowed for the moving of piping, ductwork, conduit or equipment to clear such interferences.
16. Coordinate with the local Electric Utility Company and the local Telephone Company as to their requirements for service connections; provide all necessary materials, labor, and testing.
 17. Coordinate installation of required supporting devices in form work and set sleeves in poured-in-place concrete and other structural components as they are constructed. Locate all chases, shafts and openings required for the installation of the electrical Work during framing of the structure. Do any cutting and patching required due to improperly located or omitted openings with the approval of the City of New York's Representative, who must also approve any additional changes resulting from relocation or omission of openings. Cutting or drilling in any structural member is prohibited without prior written approval of the City of New York's Representative.
 18. Coordinate requirements for access panels and doors for electrical items requiring access that are concealed behind finished surfaces. Locate starters, disconnects, switches, receptacles, and pullboxes to provide easy access for operation, repair, and maintenance. Access panels and doors are specified in Division 8 Section "Access Doors and Frames."
 19. Furnish to appropriate trades, shop drawings, catalog sheets and instructions necessary for construction of concrete bases, concrete encasement, anchor bolts, and other construction required to accommodate installations under other Sections.
 20. Before installing electrical work, all pertinent drawings shall be studied and precise information obtained from the architectural schedules, scale drawings, large scale and full size details of finished rooms, reviewed shop drawings or from the Commissioner. It shall be understood that even after all the coordination there may be cases where some electrical work, due to the unforeseen site conditions, may required to be relocated within 10 feet from the location shown. In such cases, the contractor shall relocate the electrical work if so directed by the Commissioner or City of New York at no increase in cost. Make any necessary adjustment of the work to fit conditions for luminaries, switches, Fire alarm devices and for outlets occurring in glazed tile, block, wood paneling or other special finish material in order that all boxes shall be flushed with finish and be centered properly. In centering outlets make due allowance for overhead piping, ducts, window and door trim, variations in thicknesses of furring, plastering, etc., as erected, regardless of conditions which may be otherwise shown on small scale drawings. Electrical work incorrectly located shall be properly relocated without expense to the City of New York
 21. In Mechanical Rooms, Electric Rooms, Elevator Machine Rooms, Pump Rooms, Communications Rooms, etc., light fixture arrangement shall be adjusted to suit the final coordinated equipment, duct, conduits, racks and piping layouts. Fixtures shall be mounted approximately 9 feet 0 inches above the finished floor, unless otherwise noted on the Drawings.
 22. Coordinate all components and aspects of the work, in order to minimize power shutdowns to the power distribution systems. Should any part of the Work require an "off-hours" shutdown, supply temporary services or power supply to maintain operation of the existing systems and equipment.
 23. Ensure clean pathways including use of elevators, hoists, cranes / gantries for transformation of equipment to designated locations. Coordinate all openings required for equipment passage with General Contractor.
 24. Examination of Site: The Contractor shall visit the site and thoroughly review the locale, working conditions, conflicting utilities and the conditions in which the electrical work will take place. Verify all existing conditions in the field. No allowances will be made subsequently for any costs that may be incurred because of any error or omission due to failure to examine the site and to notify the City of New York's Representative of any discrepancies between Drawings and Specifications and actual site conditions.
 25. Verifying existing conditions before commencing work, examine all adjoining work on which this work is in any way dependent for perfect workmanship according to the intent

of this Specification, and report to Construction Manager any condition, which prevents performance of first-class work. No "waiver of responsibility" for incomplete, inadequate or defective adjoining work will be considered unless notice has been filed before submittal of a proposal.

1.12 DELIVERY, STORAGE, AND HANDLING

- A. Include all shipping, delivery, hauling, hoisting, shoring, and placement in the building of equipment and materials specified herein. The Contractor shall be responsible for the timely delivery of equipment to the project site as required by the construction schedule. If any item of equipment is received prior to the time, it is required, the Contractor shall be responsible for its proper storage and protection until it may be required. The Contractor shall pay for all costs of storage in a bonded warehouse.
- B. Delivery: Deliver equipment, fixtures, devices and conduits with factory-fabricated containers and protective means. Maintain containers and protective means through shipping, storage, and handling to prevent damage and to prevent exposure to dirt, debris, and moisture.
- C. Storage: Store in a clean, dry, ventilated space free from temperature extremes. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect equipment from dirt, water, construction debris, and traffic.
- D. Handling: Handle in accordance with manufacturer's written instructions. Be careful to prevent internal component damage, breakage, denting and scoring. Damaged units shall not be installed and shall be replaced with new units.
- E. If any item of equipment is not delivered to or installed at the Project site in a timely manner as required by the Project construction schedule, the Contractor shall be solely responsible for disassembly, re-assembly, manufacturer's supervision, shoring, general construction modifications, delays, overtime costs, etc. No additional cost or delays shall be incurred by the City of New York
- F. All other trades' equipment, materials and work shall be protected from damage in areas where electrical work is being carried out. All damage shall be corrected in a manner acceptable to the Commissioner and the City of New York without additional cost to the City of New York.
- G. The Contractor shall be responsible for all work, materials and equipment until finally inspected, tested and accepted; protect work against theft, injury or damage; and carefully store material and equipment received on site, which is not immediately installed. All the equipment, materials and the work shall be covered and protected during construction to prevent entry of dust, dirt, obstructing material and to prevent damage due to weather, water, spray-on fireproofing, construction debris, etc., in a manner acceptable to the Commissioner and/or City of New York.
- H. All equipment, materials, devices, etc stored off site and delivered to the site must be kept in the manufacturers' original unopened protective packaging with shipping bars, retainers and positioning devices in place until installation. Store all items subject to moisture damage in dry and heated space with factory covering in place.

PART 2 - PRODUCTS

2.1 MATERIALS FURNISHED

- A. New, bearing label of Underwriter's Laboratories, or other testing laboratory acceptable to authority having jurisdiction, where labeling exists for the class of equipment.
- B. Equipment and materials furnished shall be new and unused, prior to this installation, first grade commercial quality and shall be essentially the standard cataloged products of a manufacturer regularly engaged in the manufacture of the products. Only those items specifically shown on the Drawings as existing relocated or City of New York furnished shall be reused in this installation. Rebuilt or remanufactured equipment will not be permitted.
- C. Since manufacturing methods vary, reasonable minor variations are expected; however, performance and material requirements specified herein are the minimum standards acceptable. The Commissioner retains the sole right to judge the equality of equipment that deviates from the Contract Documents, to reject any substitutions submitted by the Contractor, and to require the specified materials and equipment, which conform to the requirements of the Contract Documents, be furnished.
- D. Equipment and materials that have defects or damage during transportation, installation, or operation is considered as totally damaged. They shall be replaced new. The materials and equipment, which have minor damage, may be repaired if written approval is given by the Commissioner and City of New York. If equipment and materials are approved for repairs, they shall be repaired in a manner acceptable to the City of New York and Commissioner at no additional cost to the City of New York. The Contractor shall be responsible for all costs associated with the repairs, replacement, including but not limited to, all preparations prior to re-testing, extended warranties, re-commissioning of the equipment, etc.
- E. Where no specific make of material or equipment is mentioned, use any product of reputable manufacturer, which conforms to requirements of system and other applicable specification sections.
- F. Provide an authorized representative to constantly supervise Work specified in this Division; check all materials prior to installation for conformance with Drawings, Specifications, and reviewed Shop Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION OF EQUIPMENT

- A. Install electrical equipment as specified in individual specification sections, and in accordance with manufacturer's recommendations.
- B. Rough-in locations for fixtures and equipment shall be determined from the unit itself or from the approved shop drawings.
- C. Provide all necessary anchoring devices and supports (refer to Paragraph 3.2 Seismic Protection).
 - 1. Use structural supports suitable for equipment, or as indicated.
 - 2. Check loadings and dimensions of equipment with shop drawings.

3. Do not cut or weld to building structural members
- D. Arrange for necessary openings to allow for admittance of equipment. Where equipment cannot be installed as structure is being erected, provide and arrange for building-in of boxes, sleeves, or other devices to allow later installation.
- E. Install equipment to permit easy access for normal maintenance.
1. Maintain easy access to switches, motors, drives, pullboxes, receptacles, etc.
 2. Notify the City of New York's Representative in writing of relocation items, which interfere with access.
- F. Equipment Pads, Mats and Mounting
1. Concrete pads for various pieces of equipment systems will be furnished by other Division.
 2. Contractor shall provide fully dimensioned pad layouts to the General Contractor. Shop Drawings shall be used for dimensional guidance in sizing pads, anchor bolts, locations, etc.
 3. Pads shall be provided for floor-mounted equipment, equipment mounted on legs and/or support stands and they shall conform to the shape of the piece of equipment it serves with a minimum 3 in. margin around the equipment and supports. Pads shall be a minimum of 4 in. high and made of a minimum 28-day, 3000 psi concrete reinforced with 6"x6", 6/6 gauge welded wire mesh. Top and sides of the pad shall be troweled to smooth finishes, equal to those of the floors, with all corners bullnosed to 3 / 4" radius.
 4. Pads shall be dowelled into slab with #4 bars at each corner embedded 3" and grouted with non-shrink grout.
 5. Concrete waterproof curbs shall be provided around all vertical bus floor penetrations. These curbs shall be a 4 in. high and shall be poured as part of the floor slab. Coordinate exact dimensions of slab penetration and curb with the busduct manufacturer.
 6. Furnish and install galvanized anchor bolts for all equipment placed on concrete equipment pads, inertia blocks, or on concrete slabs. Bolts shall be the size and number recommended by the Manufacturer of the equipment and as required for seismic restraint. Anchor bolts shall be anchored to the structural floor slab and shall be located by means of suitable templates. When equipment is placed on vibration isolators, the equipment shall be secured to the isolator and the isolator secured to the floor, pad, or supported as recommended by the vibration isolation manufacturer.
 7. Equipment pads for switchboards, switchgears, transformers shall have level mounting channels embedded in the concrete as specified in the applicable sections. Where equipment is mounted on gypsum board partitions, the mounting screws shall pass through the gypsum board and be securely attached to the partition studs or framework.
 8. Rubber Mats
 - a. Install a continuous one-piece rubber mats in front of each electrical equipment such as switchboard, motor control center, switchgear, generator paralleling switchgear, Uninterruptible Power Supply equipment, substation transformers, each side of a generator set, etc.
 - b. Rubber mats when installed shall lay flat without curling.
 - c. Rubber mats shall conform to ASTM D 178, Type 2
- G. Penetrations:
1. Avoid, if possible, the penetration of any waterproof membranes such as roofs, machine room floors, basement walls, and the like. If such penetration is necessary, perform it prior to the waterproofing and furnish all sleeves or pitch-pockets required. Advise the

- Commissioner and obtain written permission before penetrating any waterproof membrane, even where such penetration is shown on the Drawings.
2. If Contractor penetrates any walls or surfaces after they have been waterproofed, he shall restore the waterproof integrity of that surface as directed by the Commissioner at his own expense.
 3. Pack space between conduits, sleeves, cable trays and seal unused sleeves in non-fire rated walls with non-combustible materials. Refer to specifications for details and requirements.
 4. Conduit enters the building through a concrete foundation wall below grade level; a watertight entrance seal shall be used. The seal shall be OZ/Gedney.
 5. Make penetrations through floors, walls and any damp-proofed/water-proofed surfaces, damp-proof/waterproof by appropriate means to maintain integrity of system penetrated. Refer to specifications for details and requirements.
 6. Seal around penetrations and between conduits, cable trays, sleeves, etc and seal unused sleeves, in fire rated walls with UL listed fireproofing material to maintain integrity fire rating. Refer to specifications for details and requirements.
 7. The Contractor shall be responsible for the timely placing of sleeves for all piping passing through walls, partitions, beams, floors, and roofs, while the same are under construction.

H. Expansion/Deflection

1. Equip all cable trays and conduits, including those embedded in concrete, which cross building expansion or control joints, with expansion fittings.
2. Where conduits are subjected to expansion and movement in any directions or to vibration transmitted by equipment or vehicular traffic, install a combination expansion and deflection fittings.

I. Support

1. Provide required supports and hangers for conduit and equipment, so that loading will not exceed allowable loadings of structure. Submittal of a bid shall be deemed a representation that such bid has included allowable loadings and has included in estimates the costs associated in furnishing required supports.
2. The design of the supports for conduits, busduct and equipment shall be certified and sealed by a Professional Engineer licensed in the State in which the work is to be performed.
3. Where busduct, conduits, etc., are routed vertically through shafts, the Contractor shall provide and install all necessary miscellaneous structural members to support the loads imposed by the risers.
4. Where equipment (transformers, busducts, conduit racks, etc.) are supported from structural slabs, the Contractor shall provide all miscellaneous structural members to support the load plus a 250 lb. live load.
5. The Contractor shall submit Shop Drawings of the riser support system inside vertical shafts to the project Structural Engineer for approval, including details of how the riser support structure is to be attached to the building structure
6. Miscellaneous structural support members installed in Switchboard Rooms, electric closets, central plants, Mechanical Rooms, and where exposed to public view shall be galvanized.
7. Include supporting frames or racks extending from floor slab to ceiling slab for work indicated as being supported from walls where the walls are incapable of supporting the weight. In particular, provide such frames or racks in electric closets.
8. Include supporting frames or racks for equipment, intended for vertical surface mounting, which is required in a freestanding position. Supporting frames or racks shall be of standard angle, standard channel or specialty support system steel members. They shall be rigidly bolted or welded together and adequately braced to form a substantial structure. They shall be firmly secured to the floor slab with expansion anchors designed

to support the system and the equipment. Racks shall be of ample size to assure a skillful arrangement of all equipment mounted on them and shall not impinge code required work space of other equipment, devices, access panel, junction boxes, pull boxes, etc.

9. Wall mounted equipment may be directly secured to wall by means of steel bolts. Maintain at least 1" air space between equipment and supporting wall. Groups or arrays of equipment may be mounted on adequately sized steel angles, channels, or bars. Prefabricated steel channels providing a high degree of mounting flexibility, such as those manufactured by Kindorf, Glob-Strutt and Unistrut, may be used for mounting arrays of equipment.
10. No equipment, including outlet, pull and junction boxes and fittings, shall depend on electric conduits, raceways, or cables for support, except that threaded hub type fittings having a gross volume not in excess of 100 cubic inches may be supported from heavy wall conduit, where the conduit in turn is securely supported from the structure within five inches of the fitting on two opposite sides.
11. Nothing shall rest on, or depend for support on, suspended ceilings media (tiles, lath, plaster, as well as splines, runners, bars and the like in the plane of the ceiling). If suspended ceilings are used to support lighting fixtures, they shall be designed to support the weight of the fixtures. Branch circuit conduit up to 3/4" may be permitted to be supported from ceiling hanger rods if the allowable loading of the rods is not exceeded and approved by the Commissioner.
12. For items, which are shown, as being ceiling mounted at locations where fastening to the building construction element above is not possible, provide suitable auxiliary channel or angle iron bridging, tying to the building structural elements.

J. DISSIMILAR METALS

1. Dissimilar metals shall mean those metals, which are incompatible with one another in the presence of moisture. Where dissimilar metals come in contact, paint the joint both inside and out with approved coating to exclude moisture from the joint, or provide a suitable insulating barrier separating the metals.
2. Transitions in raceways, from one metal to a dissimilar metal shall only be made at boxes or other enclosures.

K. Voltage Check

1. At completion of job, check voltage at several points of utilization on the system, which has been installed under this Contract. During test, energize all installed loads.
2. Adjust taps on transformers to give proper voltage, which is 118 to 122 volts for 120-volt nominal systems and proportionately equivalent for higher voltage systems. If proper voltage cannot be obtained, inform the Commissioner and the City of New York.

3.2 SEISMIC PROTECTION

- A. Seismic restraints for equipment, conduits, cable trays, devices, luminaries, equipment housekeeping pads and equipment supports shall be provided and shall comply with the latest Seismic and applicable codes. Refer to the applicable specification sections for other requirements.
- B. Seismic restraint design shall be certified and sealed by a Professional Engineer licensed in the State in which the work is to be performed.

3.3 EQUIPMENT NOISE AND VIBRATION

- A. Equipment and systems, as defined herein, shall be quiet and free of apparent vibration while in operation.
- B. Vibration shall not be apparent to the senses in occupied areas of the building. Both the balancing of rotating machinery and the installation of vibration isolators are required.
- C. Any additional precautions deemed necessary to provide a quiet installation shall be done as part of the Work of this Section, subject to review by the Commissioner and without additional cost to the City of New York. After the systems are in operation, it shall be the responsibility of the Contractor to make any changes to equipment or Work

3.4 SETTING OF PROTECTIVE DEVICE

- A. Prior to final completion of the Project, set all protective device relays and internal settings based on the accepted coordination study.

3.5 IDENTIFICATION

- A. The Contractor shall identify all piping, conduit, machinery, and equipment in accordance with SECTION 26 05 53 – IDENTIFICATION for ELECTRICAL SYSTEMS.
- B. The Contractor shall submit a schedule for equipment identification.

3.6 EXCAVATION AND BACKFILL

- A. General
 - 1. Do all excavation and backfill required to install the work in this Division.
 - 2. All excavating, trenching and backfilling required for this Division shall be done in accordance with the applicable requirements in Division 1 DDC General Conditions. All excavating and backfilling, repaving all cuts, and providing and maintaining all protective measures for the excavation shall be in accordance with Division 1 DDC General Conditions.
- B. Excavation: Bury conduits outside the building to a depth of not less than 30 inches below finish grade unless noted otherwise.
- C. Backfilling: Do not backfill until final inspection and approval for the conduit installation by the local authority having jurisdiction.

3.7 CUTTING AND PATCHING

- A. Field verify openings indicated on the Drawings. Provide all cutting and patching required for electrical work.
- B. Sleeves and inserts: Provide all sleeves, inserts, and openings necessary for the installation of the Electrical Work. Provide sleeves in all floors (except where fire proofing is required) and concrete walls.

- C. Openings for all electrical equipment shall be field verified:
1. Special forming, recesses, chases, and curbs, for the correct reception and installation of the electrical equipment, as shown on the Drawings, are specified in other divisions.
 2. Ascertain that provisions have been made for the Work. If such provisions are not made in time, the Contractor shall bear all extra costs incurred in late cutting and patching to accommodate the work.
 3. The work shall be carefully laid out in advance. Where cutting, channeling, chasing or drilling of floors, walls, partitions, ceilings or other surfaces is necessary for the proper installation, support or anchorage of raceway, outlets or other equipment, the work shall be carefully done and where required, fire rating integrity shall be restored. Any damage to the piping, equipment or defaced finish plaster, woodwork, metalwork, etc. shall be repaired by skilled mechanics of the trades involved at no additional cost to the City of New York. Refer to architectural specifications for details and requirements.
 4. The Contractor shall do no cutting, channeling, chasing or drilling of unfinished masonry, tile, floor slab, etc., unless he first obtains permission from the Commissioner. If permission is granted, the Contractor shall perform this work in a manner approved by the Commissioner.
 5. If holes and/or sleeves are not properly installed and cutting and patching becomes necessary, it shall be done at no additional expense to the City of New York. The Contractor shall undertake no cutting or patching without first securing the Commissioner's written approval.
 6. Where other Trades are required to do cutting and patching, furnish to the Construction Manager necessary information so that openings for this work can be built into the floors and walls in time. Such cooperation is required to keep cutting of walls and floors to a minimum.
 7. Should Contractor neglect to perform preliminary work, and should cutting be required in order to install equipment, conduits, etc, the expense of this cutting and restoring of surfaces to their original condition shall be borne by this Contractor.

3.8 PROTECTION AND CLEANING

- A. Protection: Fully protect all finished parts of the materials and equipment against physical damage from whatever cause during the progress of the work and until completion.
- B. During construction, cap all conduits to prevent the entrance of sand and dirt.
- C. Cleaning: After installation has been completed, the Contractor shall clean all systems as follows:
1. Equipment with Factory Finish: Clean exterior thoroughly to remove grease, oil, plaster, cement and dirt, and leave surfaces clean and polished.
 2. Equipment to be painted:
 - a. Clean exterior of piping and equipment exposed in completed structure, removing rust, plaster, cement and dirt by wire brushing. Remove grease, oil and similar materials by wiping with clean rags and solvents.
 - b. Equipment furnished under this Section shall have factory-applied finish. If the factory finish is damaged during shipment, storage, installation, etc., it shall be repainted by this Contractor subject to the Commissioner's approval. Touch-up painting is acceptable only for minor finish damage.
 - c. Provide a heavy field coat of black asphalt paint on all steel conduits, cradles, vibration isolating mounts, and the like, that will be encased or partially encased in

building construction, set in cement or fill, before items are built into the general construction.

- d. Where conduits, mounting channels, outlet, junction, or pull boxes are mounted on a painted surface, or a surface to be painted they shall be painted, by this contractor, to match the surface.
3. Contractor shall take care to avoid accumulation of debris, boxes, crates, etc., resulting from the installation of the work. Contractor shall remove from the premises each day all debris, boxes, etc., and keep the premises clean, subject to the Commissioner's instructions, which shall be promptly carried out.
4. Contractor shall clean up all luminaries and equipment at the completion of the project.
5. All switchboards, switchgears, busway, panelboards, wireways, transformers, transfer switches, trench ducts, cabinets, enclosures, etc. shall be thoroughly vacuumed clean prior to energizing equipment and at the completion of the project. Equipment shall be opened for observation by the Commissioner as required.

3.9 FINAL ACCEPTANCE TESTS

- A. The entire electrical installation shall be pre-tested, inspected, thoroughly cleaned, and damaged finishes touched up after final completion prior to final acceptance testing being performed. Not less than 30 days prior to the final acceptance testing, furnish the pre-test results and a test plan, to the Commissioner for review, outlining all aspects of the testing, including tests to be performed and the expected results.
- B. The Contractor shall provide a detailed schedule of completion indicating when each system is to be completed and outlining when tests will be performed. Completion schedule shall be submitted to the Commissioner, and City of New York for review at the time requested by the Construction Manager after the notice to proceed has been given by the City of New York. This schedule shall be updated periodically by the Contractor as the Project progresses. Each update shall be submitted to the Commissioner, and City of New York for review.
- C. Provide complete documentation of all component and system tests prior to City of New York acceptance and turnover of components or systems. In addition, the City of New York reserves the right to review all test objectives, test plans and test cases, and witness all preoperational tests. Provide the City of New York with a comprehensive schedule detailing the preparation of testing documentation and the conduct of all component or system tests.
- D. Operate all electrical systems and equipment for a period of 24 hours, unless in the opinion of the Commissioner, a different test period is required, to prove the operation and performance of a system and its equipment.
- E. Should the foregoing test reveal any defects, promptly correct such defects and re-run the tests until the entire installation conforms to the requirements of these Specifications and the Drawings.
- F. Tests requiring certified reports and those requiring factory or field inspection shall be conducted and reported to the Commissioner in conformance with standards specified in the applicable sections.
- G. In addition to the tests outlined above, after completion of the electrical system and prior to occupancy, the following equipment and devices, as a minimum, shall be thermo graphically inspected.
 1. Feeder splices and Connections.

2. Switchboard.
 3. Transformer.
 4. Switchgear.
 5. Panelboards.
 6. Motor control center
 7. Automatic transfer switch and emergency power system connections.
 8. All cable connections rated 100 amperes (#3 AWG) or greater.
- H. The inspection shall be made by an independent inspection company. The inspection shall be made with all equipment, motors, lighting fixtures, and miscellaneous loads operating and with equipment covers removed.
- I. Inspection reports complete with color photographs of the infrared scan and control photographs indicating the ambient temperature and any hot spots of each item inspected shall be submitted to the Commissioner for approval. Any equipment, connections or devices indicated to be operating improperly performing equipment shall be replaced or repaired by the Contractor at no cost to the City of New York.
- J. The date for the final performance acceptance testing shall comply with the Project construction schedule and shall be sufficiently in advance of the Contract completion date to permit the execution of the testing by the Contractor prior to occupancy and the closeout of the Contract. Specific attention is required for any special spaces such as Tenant Areas, which will be governed, by a separate construction and turnover schedule from that provided for the overall project. Any adjustments and/or alterations, which the final acceptance tests indicate as necessary for the proper and satisfactory functioning of all equipment and systems, shall be completed prior to the closeout of the Contract. Re-tests shall not relieve the Contractor of completion date responsibility.

3.10 DEMONSTRATION AND OPERATION INSTRUCTIONS

- A. After completion of all testing, and prior to placing equipment or systems in operation, demonstrate the features and operation of the equipment or systems to the Commissioner, City of New York, operational and maintenance personnel so that they are familiarized with the equipment and systems, in particularly the following equipment and systems:
1. Switchboards and panelboards.
 2. Transformer.
 3. Switchgear.
 4. Power monitoring System
 5. Revenue metering System
 6. Emergency power System
 7. Lighting Control system
 8. Fire alarm and smoke detection systems.
 9. Automatic transfer switches
 10. Other equipment and control systems shown on the Drawings.
- B. Provide the necessary accessories, test equipment, and personnel, for each demonstration.
- C. Complete all arrangements for the demonstrations through the Commissioner.
- D. Upon the completion of each demonstration or instructional session, obtain "sign-off" from the Commissioner and City of New York. The "sign-off" shall state that the demonstration or instructions for use were provided, that they were complete and were given to the designated personnel.

- E. The Contractor shall provide the services of a factory trained specialist to supervise the commissioning, startup, and operation of all equipment specified herein and to instruct the City of New York's operators during an operating instruction period at or near the Project site. The operating instruction period shall be defined as straight time working hours and shall not include nights, weekends, or travel time to and/or from the Project. See individual sections of these specifications for additional instructions by manufacturer-trained specialists.
- F. The City of New York shall be notified in writing at least two (2) weeks before each operating instruction period begins. The Contractor shall commence no instruction period until the City of New York has issued his written acceptance of the starting time.

3.11 OPERATION AND MAINTENANCE MANUALS

- A. The Contractor shall provide operating instructions and maintenance data books for all equipment and materials furnished under this Section.
- B. Submit six (6) copies of operation and maintenance manuals for review at least ten (10) weeks before Final Review of the Project. Assemble all data in a completely indexed volume or volumes in three-ring binders and identify the size, model, and features indicated for each item. The binders shall have the Project Name and Logo printed on the outside of the binders. These manuals shall be submitted and subjected to the same approval process as detailed for shop drawings and samples as provided in Article 1.18 but shall be returned as "REVIEWED." Submit four (4) copies of the "REVIEWED" operation and maintenance books to the Construction Manager upon Project completion.
- C. Operation and Maintenance manuals shall include complete cleaning, and servicing data compiled in clearly and easily understandable form. Data shall show serial numbers and model numbers of each piece of equipment, complete lists of replacement parts (including part numbers), motor ratings, and actual loads.
- D. Include the following information where applicable:
 - 1. Identifying name and mark number.
 - 2. Locations of major equipment (where several similar items are used, provide a list).
 - 3. Complete nameplate data.
 - 4. "Reviewed" submittals as returned to this Contractor.
 - 5. Parts list.
 - 6. Performance curves and data.
 - 7. Wiring diagrams.
 - 8. Lubrication charts.
 - 9. Manufacturers' recommended operation and maintenance instructions with all non-applicable information deleted.
 - 10. List of spare parts recommended for normal service requirements.
 - 11. Assembly and disassembly instructions with exploded view Drawings where available.
 - 12. Trouble shooting diagnostic instructions where available.

3.12 FINAL REVIEW

- A. At a time designated, the entire installation shall be reviewed for compliance with the Contract Drawings and Specifications. The Contractor shall be available at all times during this Review.
- B. The Contractor shall demonstrate prior to the Final Review that all systems and all equipment have been properly adjusted and comply with the requirements of the Contract Documents.

After these demonstration tests are completed satisfactorily, but prior to the Final Review field visit, by the Commissioner the Contractor shall submit to the Commissioner a written certification that 1) attests to Contract Document compliance for this Project, and 2) certifies that the equipment and materials installed in this Project under this Section contain no asbestos or PCB.

- C. Certificates and Documents required herein shall be in order and presented to the Commissioner at least two (2) weeks prior to the Final Review.
- D. After the Final Review, any changes or corrections noted as necessary for the Work to comply with these Specifications and the Drawings shall be accomplished immediately in order to secure final acceptance of the Work.

END OF SECTION 260500

SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For testing agency.
- C. Field Quality-Control Test Reports: From a qualified testing and inspecting agency engaged by Contractor.
- D. Submit invoices and documentation from manufacturer of the amounts of post-consumer and post-industrial recycled content by weight for products with specified recycled content.
- E. Submit invoices and documentation showing manufacturing locations and origins of materials for products manufactured and sourced within an 800 kilometer radius of the building site.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the International Electrical Testing Association and that is acceptable to authorities having jurisdiction.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 CONDUCTORS AND CABLES

A. Manufacturers:

1. American Insulated Wire Corp.; a Leviton Company.
2. General Cable Corporation.
3. Senator Wire & Cable Company.

B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.

C. Conductor Material: Copper complying with NEMA WC 5 or 7; solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.

D. Conductor Insulation Types: Type THHN-THWN, XHHW

2.3 CONNECTORS AND SPLICES

A. Manufacturers

1. AFC Cable Systems, Inc.
2. AMP Incorporated/Tyco International.
3. Hubbell/Anderson.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

A. Conductors shall have Underwriters Laboratories, Inc. (UL) listed 600 volts insulation of type specified below or elsewhere in the Specifications.

1. Branch Circuits - Lighting and Power
 - a. #10 AWG and smaller, shall be solid conductors.
 - b. #8 AWG and larger, shall be stranded conductors.
 - c. The insulation shall be type THHN
2. Feeders (100A and more): the insulation shall be type XHHW-2 or THHN.
3. For conductors installed in exposed conduit outside of Buildings, in exposed conduit in tunnel and conduit within or just under roofing material, provide type XHHW-2.

B. Fire Alarm Circuits: Cable per Division 28 Section "Fire Alarm System". Install cable in raceway per requirements of this section, Division 26 Section "Raceways and Boxes for Electrical Systems", and Division 28 Section "Fire Alarm System."

C. Class 1 Control Circuits: Type THHN-THWN, in raceway.

D. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.2 INSTALLATION

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 26 Section "Common Work Results for Electrical."
- F. Seal around cables penetrating fire-rated elements according to Division 7 Section "Firestops and Smoke seals."
- G. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

3.3 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.
- D. All splices and terminations for conductors No. 6 AWG and larger shall utilize compression type connectors.

3.4 FIELD QUALITY CONTROL

- A. Testing: Engage a qualified testing agency to perform the following field quality-control testing:
- B. Testing: Perform the following field quality-control testing:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
 - 2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.
 - 3. Perform insulation resistance test on conductors #2 and larger with respect to ground and adjacent conductors.
- C. Test Reports: Prepare a written report to record the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION 26 05 19

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SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Data: For the following:
 - 1. Ground rods.
- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- D. Field Test Reports: Submit written test reports to include the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Person currently certified by NETA to supervise on site testing.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Grounding Conductors, Cables, Connectors, and Rods:

- a. Erico Inc.; Electrical Products Group.
- b. Boggs, Inc.
- c. Chance/Hubbell.

2.2 GROUNDING CONDUCTORS

- A. For insulated conductors, comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- B. Material: Copper.
- C. Equipment Grounding Conductors: Insulated with green-colored insulation.
- D. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.
- E. Grounding Electrode Conductors: Stranded cable.
- F. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.
- G. Bare Copper Conductors: Comply with the following:
 1. Solid Conductors: ASTM B 3.
 2. Assembly of Stranded Conductors: ASTM B 8.
 3. Tinned Conductors: ASTM B 33.
- H. Copper Bonding Conductors: As follows:
 1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch in diameter.
 2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
 3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
 4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- I. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.3 CONNECTOR PRODUCTS

- A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.
- B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.
- C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.4 GROUNDING ELECTRODES

- A. Ground Rods: Sectional type; zinc-coated steel.
 1. Size: 3/4 inch by 10 feet and 5/8 by 96 inches in diameter.

- B. Chemical Electrodes: Copper tube, straight or L-shaped, filled with nonhazardous chemical salts, terminated with a 4/0 bare conductor. Provide backfill material recommended by manufacturer.
- C. Test Wells: Provide handholes as required.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.
- B. In raceways, use insulated equipment grounding conductors.
- C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.
- D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.
- E. Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolts.
- F. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 - 1. Use insulated spacer; space 2 inches from wall and support from wall 6 inches above finished floor, unless otherwise indicated.
 - 2. At doors, route the bus up to the top of the door frame, across the top of the doorway, and down to the specified height above the floor.
- G. Underground Grounding Conductors: Use tinned copper conductor, No. 2/0 AWG minimum. Coordinate burial depths as shown on drawings.
- H. Indoor paints & adhesives to meet LEED-NC(Latest Version) required VOC limits.

3.2 EQUIPMENT GROUNDING CONDUCTORS

- A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
- B. Install equipment grounding conductors in all feeders and circuits.
- C. Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by NEC:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Three-phase motor and appliance branch circuits.
 - 6. Flexible raceway runs.
 - 7. Armored and metal-clad cable runs.

- D. Computer Outlet Circuits: Install insulated equipment grounding conductor in branch-circuit runs from computer-area power panels or power-distribution units.
- E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
- F. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate equipment grounding conductor. Isolate equipment grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
- G. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.
- H. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.
- I. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate equipment grounding conductor to each electric water heater, heat-tracing, and antifrost heating cable. Bond conductor to heater units, piping, connected equipment, and components.
- J. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 - 1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a ¼ by 4 by 12 inch grounding bus.
 - 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
- K. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.

3.3 INSTALLATION

- A. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.
 - 1. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
 - 2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.
- B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded

connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

- D. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.

3.4 CONNECTIONS

- A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 - 4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
 - 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
- E. Connections at Test Wells: Use compression-type connectors on conductors and make bolted-and clamped-type connections between conductors and ground rods.
- F. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
- G. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
- H. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.5 FIELD QUALITY CONTROL

- A. Testing: Perform the following field quality-control testing:
1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
 2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
 3. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
 - a. Equipment Rated 500 kVA and Less: 10 ohms.
 4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 26 05 26

SECTION 26 05 27 - AUDIO AND VIDEO SYSTEMS ELECTRICAL CONTAINMENT AND GROUNDING

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnish and install complete sound, video and communications system electrical power and isolated ground systems including but not limited to: all necessary raceway, electrical conductors, control cabinets, circuit breakers and all necessary apparatus and equipment, labor and services required to provide a system of high quality in excellent working order as specified herein and as indicated by relevant drawings.
- B. Furnish and install complete audiovisual system conduits, raceways, terminal cabinets, pull boxes, floor boxes, loudspeaker backcans, cable trays, junction boxes, wireways, and wireway ladders.

1.2 RELATED WORK

- A. Furnishing and installing performance audio and video system equipment specified in Section 27 41 16.
- B. Audiovisual System Drawings.
- C. Contractor to coordinate with Audiovisual Contractor on wiring routing and methods, conduit/junction box locations for audiovisual equipment, and routing of audio, video, control, and power cables/conduits to System Equipment Racks.

1.3 CODES

- A. Work shall be performed in accordance with all applicable requirements of all governing codes, rules and regulations including the following minimum standards, whether statutory or not:
 - 1. Uniform Building Code (UBC)
 - 2. National Electric Code (NEC).
 - 3. National Fire Protection Association (NFPA).
 - 4. City, and other local codes and requirements

1.4 STANDARDS

- A. Equipment and materials specified shall conform to the current edition of the following standards where applicable:
 - 1. UL – Underwriters' Laboratories
 - 2. ASTM – American Society for Testing Materials
 - 3. NEMA – National Electrical Manufacturer's Association
 - 4. ANSI – American National Standards Institute
 - 5. ETL – Electrical Testing Laboratories
 - 6. EIA – Electronic Industries Association
 - 7. ISO – International Standards Organization
 - 8. Sound System Engineering, 2nd Ed., Davis and Davis, Howard W. Sams Co., 1987.

1.5 SUBMITTALS

- A. Submit the following in accordance with DDC General Conditions.
 - 1. Shop Drawings: Prior to Assembly and Installation
 - 2. Run sheets or field wiring drawings: Clearly show wire pull routing, call out wire types and assign wire numbers to every wire in the drawing.

1.6 DELIVERY, STORAGE AND HANDLING

- A. In accordance with DDC General Conditions.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Electrical Power and Grounding
 - 1. In accordance with general requirements as per Section 26-05-00.
 - 2. Provide Isolated Ground 120VAC, 20 AMP, isolated ground duplex receptacles as shown in the drawings
 - a. HUBBELL IG-5392 or equivalent

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Electrical Power and Grounding System
- B. Provide a separate panelboard of circuit breakers to serve the audio and audiovisual equipment, located in the Audiovisual Control Room equipment racks, and other isolated ground receptacles throughout the facility, including the Isolated Ground A/V Company Switch(s).
- C. Bond the neutral conductor from each of these panels to the master ground at the service entrance. These panels will be called the AV Technical Power Panels.
- D. The raceway system will be bonded to the master ground at the service entrance.
- E. Provide the Audiovisual Technical Power Panels with a ground busbar that is totally isolated from the enclosure, raceway, and neutral conductor.
- F. Provide a connection from the master ground at the service entrance to the isolated ground busbar in the Audiovisual Technical Power Panels using a No. 4 insulated conductor run with the service conductors or in a conduit by itself. The wire will not connect to any raceway or enclosure.
- G. All branch circuits and outlets from the AV Technical Power Panels must use isolated ground (IG) receptacles.

- H. Each branch circuit shall be individually wired from the AV Technical Power Panels using three appropriately sized conductors. These are the hot, neutral, and ground conductors.
- I. Conduits carrying AC from the AV Technical Power Panels to the duplex receptacles in the sound equipment rack(s) MUST NOT contact the rack. Use short PVC sections between the EMT and the equipment racks to provide this isolation. Or, use insulated bushings and clamps as required. Outlet boxes containing IG duplex outlets MUST NOT contact the rack. Use insulated standoffs.
- J. A/V company switches shall be designed for Isolated Ground installation and provided with CAM lock connectors and a connection chamber in the amperages as shown in the drawings. Cabinets shall be weather proof where required.

3.2 EQUIPMENT SCHEDULE

- A. Loudspeaker Backcans
 - 1. Recess-mounted backcan for 8" coaxial loudspeaker
 - a. Atlas Sound 96-8-7
- B. A/V Company Switch
 - 1. Isolated ground company switch
 - a. Union Connector CSC series
 - b. Lex Products NEMA 3R CS series
 - c. Or approved equal

END OF SECTION 26 05 27

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SECTION 26 05 29 - HANGERS & SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.
3. Equipment supports.
4. Equipment anchoring and supports.
5. Fastening hardware.

- B. Related Sections include the following:

1. Division 26 Section "Vibration and Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.
2. Division 3 Section "Cast-in-Place Concrete": Concrete equipment pads.
3. Division 26 Section "Raceway and Boxes for Electrical Systems".

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

- A. Design support and anchorage systems to resist all gravity and seismic forces in accordance with the requirements of the Building Code and in accordance with procedures in Division 1.
- B. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- D. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- E. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of 3 times the applied force.

1.5 SUBMITTALS

- A. Submit dimensioned layout drawings, details, locations and structural calculations for gravity and seismic support systems. Include plans, elevations and all necessary information to satisfy the Authority Having Jurisdiction. Calculations shall be prepared and signed by a Licensed Structural Engineer.

1.6 QUALITY ASSURANCE

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Unistrut;
 - b. Cooper B-Line, Inc.;
 - c. Thomas & Betts Corporation.
 - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 3. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
 - 1. Hot-dip galvanized, cast malleable iron, one hole type strap with cast clamp-backs and spacers as required.
 - 2. OZ/Gedney "14-G" series strap and "141G" series spacer; Efcor "231" series strap and "131" series spacer; Thomas & Betts "1276" series strap and "1350" series spacer.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Remington.
 - 2) ITW Ramset.
 - 3) MKT Fastening, LLC.
2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Cooper B-Line, Inc.
 - 2) Ramset/Red Head;
 - 3) MKT Fastening, LLC.
3. Drilled sleeve type expansion anchors, Ramset "Dynabolt," "Red-Head" RM series or equal.
4. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
 - a. Pressed galvanized steel, spot insert, with oval slot capable of accepting support nuts of 6 mm (1/4-inch) to 12 mm (1/2-inch) diameter thread.
 - b. Unistrut No. M24 with "M2506" series nut; Superstrut No. 425 with "AB-102" series nut, Kinline No. 279 with "660" series nut, or equal.
5. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
6. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
7. Toggle Bolts: All-steel springhead type.
8. Hanger Rods: Galvanized rod, sized for the load unless otherwise shown or specified.
9. deck inserts
 - a. Steel plate 5 mm (3/16-inch) thick with threaded galvanized steel rod sized for load.
 - b. Superstrut No. C-475 series, Kinline No. 293 series, or equal.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be ¼ inch in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports

3.2 INSTALLATION

- A. Provide supporting devices as noted in other Sections of Division 26.
- B. Fasten hanger rods, conduit clamps, outlet and junction boxes to building structure using precast inserts, expansion anchors, preset inserts or beam clamps.
- C. Use hollow wall fasteners in hollow masonry walls.
- D. Use expansion anchors or preset inserts in solid masonry walls.
- E. Use self-drilling anchors or expansion anchors on concrete surfaces.
- F. Use sheet metal screws in sheet metal studs and wood screws in wood construction.
- G. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.
- H. Do not drill structural steel members unless first accepted in writing by the Commissioner.
- I. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.
- J. Install surface-mounted cabinets and panelboards with a minimum of four anchors. Provide additional support backing in stud walls prior to sheet rocking as required to adequately support cabinets and panels.
- K. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.
- L. Anchor free-standing equipment on concrete pads where indicated.
- M. Provide all cutting, Patching, and replacement/repair of walls and ceilings disturbed by this work.

3.3 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 3 Section "Cast-in-Place Concrete."
- C. Anchor equipment to concrete base.
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.4 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness o 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.5 LAYOUT

- A. Layout support devices to maintain headroom, neat mechanical appearance and to support equipment loads.

END OF SECTION 26 05 29

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SECTION 26 05 33 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. Related Sections include the following:
 - 1. Division 7 Section "Firestops and Smoke-seals" for firestopping materials and installation at penetrations through walls, ceilings, and other fire-rated elements.
 - 2. Division 26 Section "Hangers and Supports for Electrical System" for supports, anchors, and seismic restraints.
 - 3. Division 26 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.
 - 4. Division 26 Section "Identification for Electrical Systems".

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. FMC: Flexible metal conduit.
- D. IMC: Intermediate metal conduit.
- E. LFMC: Liquidtight flexible metal conduit.
- F. LFNC: Liquidtight flexible nonmetallic conduit.
- G. RNC - Rigid non-metallic conduit (Schedule 40 PVC)

1.4 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: Show fabrication and installation details of components for raceways, fittings, boxes, enclosures, and cabinets.
- C. Shop Drawings: Signed and sealed by a qualified professional engineer.
 - 1. Design Calculations: Calculate requirements for selecting seismic restraints.
 - 2. Detail assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

- D. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
1. Ceiling suspension assembly members.
 2. Method of attaching hangers to building structure.
 3. Size and location of initial access modules for acoustical tile.
 4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- E. Manufacturer Seismic Qualification Certification: Submit certification that enclosures, cabinets, accessories, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems." Include the following:
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

1.6 COORDINATION

- A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 METAL CONDUIT AND TUBING

- A. Manufacturers:
 - 1. AFC Cable Systems, Inc.
 - 2. Alfex Inc.
 - 3. Anamet Electrical, Inc.; Anaconda Metal Hose.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. IMC: ANSI C80.6.
- D. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1
- E. Plastic-Coated IMC and Fittings: NEMA RN 1
- F. EMT and Fittings: ANSI C80.3
 - 1. Fittings: Compatible with conduit and tubing materials.
- G. FMC: Zinc-coated steel, rated for wet locations.
- H. LFMC: Flexible steel conduit with PVC jacket.
- I. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

- A. Manufacturers:
 - 1. American International.
 - 2. Arnco Corp.
 - 3. Cantex Inc.
- B. ENT: NEMA TC 13.
- C. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.
- D. ENT and RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.
- E. LFNC: UL 1660.

2.4 METAL WIREWAYS

- A. Manufacturers:
 - 1. Hoffman.
 - 2. Or Approved Equal.
- B. Material and Construction: Sheet metal sized and shaped as indicated, NEMA 1.

- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.
- E. Wireways Covers: Hinged type
- F. Finish: Manufacturer's standard enamel finish.

2.5 BOXES ENCLOSURES AND CABITES

- A. Manufacturers
 - 1. Hoffman.
 - 2. Hubbell, Inc
 - 3. RACO; Division of Hubbell, Inc.
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.
- D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- E. Floor Boxes: Cast metal, fully adjustable, rectangular.
- F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- G. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- H. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.
- I. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.6 FACTORY FINISHES

- A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard paint applied to factory-assembled surface raceways, enclosures, and cabinets before shipping.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors:

1. Exposed: Rigid steel
 2. Concealed: Rigid steel
 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 4. Boxes and Enclosures: NEMA 250, Type 4.
 5. Underground: RNC (Schedule 40 PVC)
- B. Indoors:
1. Exposed: EMT.
 2. Concealed (All conduits shall be install concealed unless otherwise noted): EMT.
 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
 4. Damp or Wet Locations: Rigid steel conduit.
 5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
 6. MC cable may be used above concealed, accessible ceilings for branch circuits after the first pull point from branch circuit panel.
 - a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.
- C. Within Canopy Structural Steel – use MC cable rated of wet locations. Install UL approved conduit bodies to transition from RGS to MC cable. Support MC cable within structural steel to be per NEC requirements.
- D. Minimum Raceway Size: ¾-inch.
- E. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.
- F. Install nonferrous conduit or tubing for circuits operating above 60 Hz.

3.2 INSTALLATION

- A. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- B. Complete raceway installation before starting conductor installation.
- C. Support raceways as specified in Division 26 Section "Common Work Results for Electrical."
- D. Install temporary closures to prevent foreign matter from entering raceways.
- E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.
- F. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
 - 1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
- H. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
 - 1. Run parallel or banked raceways together on common supports.
 - 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- I. Join raceways with fittings designed and approved for that purpose and make joints tight.
- J. Tighten set screws of threadless fittings with suitable tools.
- K. Terminations:
 - 1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
 - 2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- L. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- M. Telephone and Signal System Raceways, 2-Inch and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.
- N. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box

with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 2. Where otherwise required by NFPA 70.
- O. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
- P. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.
- Q. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.
- R. Set floor boxes level. Trim after installation to fit flush with finished floor surface.
- S. Install hinged-cover enclosures and cabinets plumb. Support at each corner.
- 3.3 PROTECTION
- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.
- 3.4 CLEANING
- A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION 26 05 33

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SECTION 26 05 48 - VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes Labor, materials and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:

1. Vibration Isolation

- B. Related Work: Consult all other Sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete installation.

- C. Description of work: Provide vibration isolation for electrical equipment to prevent the transmission of vibration forces and structure transmitted sound to the building structure as indicated on the Drawings and as specified herein.

1.2 PERFORMANCE REQUIREMENTS

- A. Seismic-Restraint Loading:

1. Site Class as Defined in the New York City Building Code.
2. Assigned Seismic Use Group or Building Category as Defined in the New York City Building Code.
 - a. Component Importance Factor: 1.5.
 - b. Component Response Modification Factor: 3.5; for distributed systems (conduits).
 - c. Component Response Modification Factor: 2.5; for equipment.
 - d. Component Amplification Factor: 1.0.
3. Design Spectral Response Acceleration at Short Periods (0.2 Second): 0.246.
4. Design Spectral Response Acceleration at 1.0-Second Period: 0.073.

1.3 SUBMITTALS

- A. Product Data: For the following:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
 - a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
 - b. Annotate to indicate application of each product submitted and compliance with requirements.
3. Restrained-Isolation Devices: Include ratings for horizontal, vertical, and combined loads.

- B. Delegated-Design Submittal: For vibration isolation and seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic forces required to select vibration isolators and seismic restraints.
 - a. Coordinate design calculations with wind-load calculations required for equipment mounted outdoors. Comply with requirements in other Division 26 Sections for equipment mounted outdoors.
 2. Indicate materials and dimensions and identify hardware, including attachment and anchorage devices.
 3. Field-fabricated supports.
 4. Seismic-Restraint Details:
 - a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
 - b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
 - c. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.4 QUALITY ASSURANCE

- A. All materials, equipment and parts comprising the units specified herein shall be new.
- B. The completed installation must control vibration and noise to within the specified limits. Systems, equipment, or parts that vibrate or generate vibration unduly or that generate or emit undue noise while in operation shall: (1) be adjusted, repaired, or replaced as appropriate to obtain acceptable levels of vibration or noise, or (2) be supported on or fitted with suppression or absorption devices or means that effectively prevent the transmission of vibration or noise beyond the offending item. Undue noise and vibration is defined as that which exceeds the manufacturer's specifications or the limits established in these specification.
- C. Replace, at no extra cost to the City of New York, isolators that do not produce the required deflection, are incorrectly loaded above or below their correct operating height, or which do not produce the required isolation as approved.
- D. After completion of vibration isolation installation, provide field inspection by qualified manufacturer's representative to ensure that all vibration isolators are installed in accordance with manufacturer's printed recommendations and provide a written report.
- E. Comply with seismic-restraint requirements in the New York City Building Code unless requirements in this Section are more stringent.
- F. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If

preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

- G. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Manufacturer

1. All vibration isolation mounts shall be supplied by one of the following manufacturers:
 - a. Mason Industries Inc.
 - b. Kinetics
 - c. Vibration Mountings & Controls Inc.

B. General

1. Provide vibration isolators with either known un-deflected heights or other markings so that, after adjustment, when carrying their load, the deflection under load can be verified, thus determining that the load is within the proper range of the device and that the correct degree of vibration isolation is being provided according to the design.
2. Provide isolators that operate in the linear portion of their load versus deflection curve. Furnish load versus deflection curves from the manufacturer that are linear, over a deflection range 50% above the design deflection.
3. Where specific type of vibration isolation hardware equipment is not shown or specified, furnish isolators recommended by the isolation manufacturer compatible with equipment arrangements shown.
4. All neoprene mountings shall have a shore hardness of 40-65 after minimum aging of 30 days, or corresponding open-aging.

C. Vibration Isolators

1. Neoprene mountings shall have a minimum static deflection of 0.3". All metal surfaces shall be neoprene covered and have friction pads both top and bottom. Bolt holes shall be provided on the bottom and a tapped hole and cap screw on top. Steel rails shall be used above the mountings under equipment such as small vent sets to compensate for the overhang. Mountings shall be type ND as manufactured by Mason Industries, Inc. or Approved Equal.
2. Mount Type FS (Spring Mounting): Laterally stable spring isolators (single or multiple steel springs) seismic restraint housing and complete with 1/4" neoprene acoustical pads between the base-plate and the support. Spring diameter shall be no less than 0.8 of the compressed height of the spring at design load. Springs shall be so designed that the ratio of horizontal stiffness to vertical stiffness is approximately 1. Provide all mountings with leveling bolts, rigidly bolted to the equipment. Provide height saving mounting brackets where applicable, height adjustment bolts. Isolators shall be Mason Type "SLR" or Approved Equal.

D. Seismic-Restraint Devices

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Amber/Booth Company, Inc.
 - b. California Dynamics Corporation.
 - c. Cooper B-Line, Inc.; a division of Cooper Industries.
 - d. Hilti Inc.
 - e. Loos & Co.; Seismic Earthquake Division.
 - f. Mason Industries.
 - g. TOLCO Incorporated; a brand of NIBCO INC.
 - h. Unistrut; Tyco International, Ltd.
2. General Requirements for Restraint Components: Rated strengths, features, and application requirements shall be as defined in reports by an agency acceptable to authorities having jurisdiction.
 - a. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least 1.2 times the maximum seismic forces to which they will be subjected.
3. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.
4. Restraint Cables: ASTM A 492 stainless-steel cables with end connections made of steel assemblies with thimbles, brackets, swivels, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.
5. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod. Do not weld stiffeners to rods.
6. Bushings for Floor-Mounted Equipment Anchor: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchors and studs.
7. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices.
8. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Thoroughly examine site conditions for acceptance of equipment installation to verify conformance with manufacturer and specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 PREPARATION

- A. Housekeeping pads shall be provided for all floor mounted electrical equipment. Unless otherwise indicated, pads shall be 4" high with #4 reinforcing rods 12" on center each direction,

1-1/2" above bottom of pad. For thicker pads provide #4 rods both top and bottom 2" below and above.

- B. Foundation drawings, details, templates, pipe sleeves, vibration isolators, foundation bolts and anchored plates shall be provided by the Contractor.
- C. The Contractor shall be fully responsible for all base and foundation dimensions and bolt locations.
- D. All vibration isolators must be installed in strict accordance with the manufacturers written instructions and all certified submittal data.
- E. Installation of vibration isolators must not cause any change of position of equipment, in stresses or misalignment.

3.3 INSTALLATION

- A. All electrical conduit 2 1/2" in diameter and larger, bus ducts, cable trays and ladder trays shall be restrained with cable restraints or solid brace to meet design loading.
- B. Transverse restraints shall occur at 30' intervals or both ends if the electrical run is less than the specified interval. Transverse restraints shall be installed at each electrical services turn and at each end of the electric run.
- C. Longitudinal restraints shall occur at 60' (18m) intervals with at least one restraint per electric run. Transverse restraints for one electric section may also act as a longitudinal restraint for a duct for an electric section connected perpendicular to it if the restraints are installed within 4' (1 m) of the intersection of the electric run and if the restraints are sized for the larger electric run.
- D. All floor mounted switchboards must have a resilient media between the equipment mounting hole and the anchor bolt, coordinate with manufacture.
- E. Wall mounted panels, transformers and motor starters shall be mounted with bushings. Floor mounted panels shall be mounted on bushings.
- F. Connection to the structure must be made with a non-friction connection.
- G. Exclusions:
 - 1. All conduit less than 2 1/2" diameter suspended by individual hanger rods.
 - 2. All conduits suspended by clevis hangers where the distance from the top of the pipe to the suspension point is 12" or less.
 - 3. All trapezed conduits, bus ducts and cable trays where the distance from the suspension point to the trapeze member is 12" or less.
 - 4. If any suspension location in the run exceeds the above, the entire run must be braced.
- H. Electrical connections to vibration isolation equipment shall be flexible, having a fully-looped flex (or grossly slack shallow U) installed on isolated equipment with static deflection over 0.1". Flexible conduit to be at least 3 feet or 20 diameters long, whichever is the longer.
- I. No rigid connections between equipment and the building structure shall be made that degrades the noise and vibration control system herein specified.

END OF SECTION 26 05 48

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Special Provisions, Supplementary Conditions, and Division 1 Specification Sections apply to this Section.

1.2 SUMMARY

- A. This Section specifies electrical identification materials and includes requirements for electrical identification including but not limited to the following:
 - 1. Identification labeling for raceways
 - 2. Identification of power and control cables
 - 3. Identification for conductors
 - 4. Warning labels and signs
 - 5. Instruction signs
 - 6. Equipment identification labels
 - 7. Miscellaneous identification products

- B. Related Sections: The following Sections contain requirements that relate to this Section:

- 1. Refer to other Division 26 sections for additional specific electrical identification associated with specific items.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

- 1. Product Data for each type of product specified.
- 2. Schedule of all tags, markers, nameplates, signs, etc.

1.4 QUALITY ASSURANCE

- A. Electrical Component Standard: Components and installation shall comply with NFPA 70 "National Electrical Code."

- B. Comply with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:

- 1. American Engraving Co.
- 2. Seton Name Plate Co.
- 3. Standard Signs, Inc.

2.2 ELECTRICAL IDENTIFICATION PRODUCTS

- A. Engraved, Plastic Laminated Labels, Signs, and Instruction Plates: Engraving stock melamine plastic laminate, .06 inch minimum thick for signs up to .125 inch thick for larger sizes. Drill holes for mechanical fasteners when mounted indoors.
- B. Baked Enamel Warning and Caution Signs for Interior Use: Preprinted aluminum signs, punched for fasteners, with colors, legend, and size appropriate to the location.
- C. Exterior Metal Backed Butyrate Warning and Caution Signs: Weather resistant, nonfading, preprinted cellulose acetate butyrate signs with 20-gage, galvanized steel backing, with colors, legend, and size appropriate to the location. Provide 6mm grommets in corners for mounting.
- D. Fasteners for Plastic Laminated and Metal Signs: Self tapping stainless steel screws or number 10/32 stainless steel machine screws with nuts and flat and lock washers.
- E. Cable Ties: Fungus inert, self extinguishing, one piece, self locking nylon cable ties, 0.2inch minimum width, 50 lb minimum tensile strength, and suitable for a temperature range from minus 122 deg F to 185 deg F.
- F. Cable Markers: Provide "E-Z Tag" as manufactured by Almetek Industries Inc., or Approved Equal. Tags shall consist of 1 inch high numerals or letters placed in a tag holder. Tags and holder shall be manufactured from U.V. stabilized non-conductive, non-corrosive polyethylene or equal. Tag holder shall be black and numerals and letters shall be black on yellow background. Numerals and letters shall be oriented either horizontally or vertically depending on orientation of cable.
- G. Pressure Sensitive Markers for Outdoor Equipment: Provide markers as manufactured by Almetek Industries, William Frick & Company or Approved Equal. Provide minimum 1 inch high numerals or letters. On medium voltage equipment provide markers that are black on reflective yellow background. On low voltage equipment provide markers which are black on reflective silver background. Markers shall be resistant to U.V. light.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Lettering and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations specified or indicated. Install numbers, lettering, and colors as approved in submittals and as required by code.
- B. Install identification products in accordance with manufacturer's written instructions and requirements of NEC.
- C. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work.

- D. Low Voltage Conductor Color-Coding: Provide color coding as follows:

208/120 Volts	Phase
Black	A
Red	B
Blue	C
White	Neutral
Green	Ground

- E. Use low voltage conductors with color factory-applied the entire length of the conductors except as follows:
1. The following color-coding methods may be used in lieu of factory color-coded wire for sizes larger than No. 8 AWG.
 - a. Apply colored, pressure-sensitive plastic tape in half lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply the last two laps of tape with no tension to prevent possible unwinding.
- F. Provide warning, caution, and instruction signs as follows:
1. Install warning, caution, or instruction signs where required by NEC, where indicated, or where required for safe operation and maintenance of electrical systems. Install engraved plastic laminated instruction signs where instructions or explanations are needed for system or equipment operation. Install butyrate signs with metal backing for outdoor items. Attach signs to outdoor equipment using two-part epoxy cement.
 2. Emergency Operating Signs: Where required provide engraved laminate signs with white legend on red background with minimum 9.5mm high lettering for emergency instructions.
- G. Provide equipment/system, circuit/device identification as follows:
1. Provide engraved plastic laminate identification markers on electrical equipment. For 240V systems and below provide white lettering on black background. Text shall match terminology and numbering of the Contract Documents and shop drawings. Apply markers on all of the following:
 - a. Panelboards, electrical cabinets, and enclosures.
 - b. Disconnect switches.
 - c. Control equipment.
 - d. Circuit breakers
 - e. VFDs and starters
- H. Circuit Schedules:
1. Identify panel designation on directory card within panel.
 2. Fill out branch circuit directory indicating circuit number and area served, rooms, group of rooms, lighting, convenience outlets, motors etc. Card index shall be neatly typed.
- I. Install labels, tags and markers at locations for best convenience of viewing without interference with operation and maintenance of equipment.

- J. Pad Mounted Equipment: Place 1 inch high, black on reflective yellow marker indicating voltage and circuit number in upper left corner of exterior of door securing feeder compartment. Where two feeders enter a compartment, place marker on exterior of door along top edge opposite respective feeder.
- K. Raceway: Identify with pressure sensitive markers purpose of circuit (i.e., lighting, power, alarm, signal, PA, etc.). Place marker on junction boxes and along raceway on 150 feet centers. Markers shall be black on white background.
- L. Indoor paints & adhesives shall meet LEED-NC 2.1 required VOC limits.

END OF SECTION 26 05 53

SECTION 260573 - SHORT-CIRCUIT/COORDINATION STUDY/ARC FLASH HAZARD ANALYSIS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes services necessary to complete the system analysis studies required for the item specified under this Division, including but not limited to:
1. Short circuit study
 2. Protective device evaluation study
 3. Protective device coordination study
 4. Arc flash hazard analysis
- B. Related work: Consult all other Sections, determine the extent and character of related work and properly coordinate work specified herein with equipment specified elsewhere to perform a complete analysis study.
- C. Description of work: The studies shall include all portions of the electrical distribution system from the normal to emergency power source or sources down to and including the smallest adjustable trip circuit breaker in the distribution system.
- D. The contractor shall furnish an Arc Flash Hazard Analysis Study per the requirements set forth in NFPA 70E -Standard for Electrical Safety in the Workplace. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2004, Annex D.

1.2 REFERENCES

- A. Comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified.
1. References:
 - a. IEEE STD 242 -IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems (Buff Book)
 - b. IEEE 141 – Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems
 - c. IEEE 242 – Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
 - d. IEEE 399 – Recommended Practice for Industrial and Commercial Power System Analysis
 - e. IEEE 241 – Recommended Practice for Electric Power Systems in Commercial Buildings
 - f. IEEE 1015 – Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems.
 - g. IEEE 1584 -Guide for Performing Arc-Flash Hazard Calculations
 2. American National Standards Institute (ANSI):

- a. ANSI C57.12.00 – Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
 - b. ANSI C37.13 – Standard for Low Voltage AC Power Circuit Breakers Used in Enclosures
 - c. ANSI C37.010 – Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis
 - d. ANSI C 37.41 – Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories.
3. The National Fire Protection Association (NFPA)
- a. NFPA 70 -National Electrical Code, latest edition
 - b. NFPA 70E – Standard for Electrical Safety in the Workplace

1.3 SUBMITTALS

- A. Submit in accordance with the requirements of Section 260500: Electrical Requirements, the following items:
1. The results of the Studies shall be summarized in a final report. Submitted for review and approval.
 2. The report shall include the following Sections:
 - a. Executive Summary
 - b. Description, purpose, basis and scope of the study and a single line diagram of that portion of the power system, which is included within the scope of the study.
 - c. Tabulations of circuit breaker, fuse and other protective device ratings versus calculated short circuit duties and commentary regarding it.
 - d. Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding it.
 - e. Fault current calculations including a definition of terms and guide for interpretation of computer printout.
 - f. Details of the incident energy and flash protection boundary calculations.
 - g. Recommendations for system improvements, where needed.
 - h. Recommended size for power fuses and recommended settings for ground fault relays and for all adjustable trip relays.
 - i. One-line diagram.
 - j. Arc flash labels shall be provided in hard copy and for large system studies with more than 200 bus locations, a copy of the computer analysis software viewer program is required to provide arc flash labels in electronic format.
- B. The study shall be submitted to the Commissioner's Representative prior to final review of the distribution equipment shop drawings and prior to release of equipment for manufacture. If formal completion of the study may cause delay in equipment manufacture, approval from the Commissioner's Representative may be obtained for a preliminary submittal of sufficient data to ensure that the selection of device ratings and characteristics will be satisfactory. Then the formal study will be provided to verify the preliminary findings.
- C. The results of the short-circuit, protective device coordination and arc flash hazard analysis studies shall be summarized in a final report. No more than five (5) bound copies of the complete final report shall be submitted. For large system studies, submittals requiring more than five (5) copies of the report will be provided without the section containing the computer

7. Submittal shall include a complete bill of materials showing all items being supplied by the manufacturer and or supplier.

C. Commissioning Documentation:

1. Certificates from the manufacturer's field engineer stating the installed system is operating properly and complies with manufacturer's recommendations
2. Schedule of all tested and certified Ethernet cable run lengths

D. Record Drawings and Maintenance Manuals:

1. Operations and Maintenance Manuals shall include:
 - a. Contact information for pertinent manufacturers
 - b. Safety and Operational Instructions
 - c. Complete parts and subassembly list
 - d. Software version information
 - e. Wiring diagrams and termination schedules
 - f. Periodic Maintenance Schedule
 - g. A maintenance procedure for finishes
 - h. Certificates of compliance with applicable codes
 - i. Records of final testing and log
 - j. Spare parts list and source information
 - k. Provide the above in Universal electronic format files; pdf file type is preferred, as full size printable sheets. Submit files on standard pc format CD clearly labeled including project name, project commissioner, theatre consultant, contractor name, date of submittal.
2. Include diagrams depicting the system layout and interconnections. Reduced size, 11X17 preferred, hardcopy prints.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver equipment and controls securely wrapped in factory fabricated wooden or fiberboard containers.
- B. Handle equipment and controls carefully to prevent breakage, denting and scoring finish. Do not install damaged equipment and controls; replace and return damaged units to equipment manufacturer.
- C. Storage and Protection: All equipment shall be stored in a secure, environmentally controlled location. No equipment shall be placed until that location is substantially completed, free from construction dust and "broom clean". Store in original cartons and protect from dirt, physical damage, weather, and construction traffic.
- D. Acceptance at Site: Contractor shall accept and inventory all equipment upon delivery and provide copies of the inventory to the commissioner.

1.7 PROJECT/SITE CONDITIONS

- A. Field Measurements: Contractor is to verify all dimensions as they relate to requirements of the specification and manufacturer's requirements, and is to notify the City of New York's Representative of any variations, which would affect the installation and safe operation of the systems.

1.8 WARRANTY

- A. Special Warranty: The manufacturer of the stage lighting and control equipment shall warranty the Electrical Distribution, Dimming and Control equipment to be free from defects of material or workmanship for a period of two (2) years from the date of acceptance. During the period of this warranty, equipment, which proves to be defective, shall be repaired or replaced within thirty (30) days at no charge to the City of New York.

1.9 WARRANTY SERVICE

- A. Extra Materials:
1. Provide one of each type of control electronics module.
 2. Provide one spare module for each type of power module provided.
- B. Warranty Service: Provide warranty service for a period of one (1) year after final acceptance of the installation. This service shall cover parts and labor. This service consists of at least two (2) half-yearly visits to the site for checking and adjusting of equipment. Perform the first visit six (6) months after the system has been accepted.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide the dimming systems from components (except where otherwise stated) that are the products of one of the following manufacturers:
1. Strand Lighting, Inc., Cypress, CA

2.2 MANUFACTURED UNITS

- A. Portable Dimmer Stick:
1. General:
 - a. Portable dimmer stick shall be fully digital including modular dimming modules as well as performance networking and DMX communication components.
 - b. Dimming modules shall have the capability to switch internally between forward and reverse phase dimming.
 - c. Dimmer stick exteriors shall be finished with scratch-resistant black powder coat paint. Interior surface finishes shall be corrosion resistant.
 - d. Finished dimensions shall be nominally six (6) inches high by four (4) inches deep by seventy-two (72) inches long. The dimmer stick shall not weigh more than 40 pounds.
 - e. Provide a minimum of two (2) hanger styles including a pipe mounting bracket with cheeseborough style clamp as well as a modified pipe mounting bracket with cheeseborough style clamp that can support a single piece of schedule 40 pipe to mount underneath utilizing a properly rated U-bolt.
 - f. Dimmer stick shall be able to accept 208V 3Ø electrical input. Input cable shall be 8'-0" with appropriately rated NEMA twistlock connector.
 - g. Each dimmer channel shall have power efficiency greater than 97% at full load with a maximum voltage drop of 2.5 volts.

1. Electric utility's overcurrent protective device
 2. Medium voltage equipment overcurrent relays
 3. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands
 4. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands
 5. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves
 6. Conductor damage curves
 7. Ground fault protective devices, as applicable
 8. Pertinent motor starting characteristics and motor damage points, where applicable
 9. Pertinent generator short-circuit decrement curve and generator damage point
 10. The largest feeder circuit breaker in each motor control center and applicable panelboard.
 11. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.
- F. Each TCC graph should include a minimum of three different size circuit breaker ratings. Provide the next downstream circuit breaker, if TCC drawing has circuit breakers with the same rating.
- G. Provide TCC graphs in the following sequence:
1. *Service Transformer Protection shall include but not limited to the primary OCP, Transformer curves secondary OCP protection and the largest feeder OCP.*
 2. *Low Voltage Switchgear shall include the Main OCP, feeder OCP and the next downstream OCP of different rating. Provide TCC graph for each feeder permutation on the switchgear.*
 3. *Low Voltage Switchboard shall include the Main OCP, feeder OCP and the next downstream OCP of different rating. Provide TCC graph for each feeder permutation on the switchboard.*
 4. *Fire Pump and Motor coordination shall include the largest motor in each panel, main OCP, motor OCP and relay.*

2.5 ARC FLASH HAZARD ANALYSIS

- A. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2004, Annex D.
- B. The flash protection boundary and the incident energy shall be calculated at all significant locations in the electrical distribution system (switchboards, switchgear, motor-control centers, panelboards, busway and splitters) where work could be performed on energized parts.
- C. The Arc-Flash Hazard Analysis shall include all significant locations in 240 volt and 208 volt systems fed from transformers equal to or greater than 125 kVA where work could be performed on energized parts.
- D. Safe working distances shall be based upon the calculated arc flash boundary considering an incident energy of 1.2 cal/cm².
- E. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Ground

overcurrent relays should not be taken into consideration when determining the clearing time when performing incident energy calculations

- F. The short-circuit calculations and the corresponding incident energy calculations for multiple system scenarios must be compared and the greatest incident energy must be uniquely reported for each equipment location. Calculations must be performed to represent the maximum and minimum contributions of fault current magnitude for all normal and emergency operating conditions. The minimum calculation will assume that the utility contribution is at a minimum and will assume a minimum motor contribution (all motors off). Conversely, the maximum calculation will assume a maximum contribution from the utility and will assume the maximum amount of motors to be operating. Calculations shall take into consideration the parallel operation of synchronous generators with the electric utility, where applicable.
- G. The incident energy calculations must consider the accumulation of energy over time when performing arc flash calculations on buses with multiple sources. Iterative calculations must take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators should be decremented as follows:
 - 1. Fault contribution from induction motors should not be considered beyond 3-5 cycles.
 - 2. Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible (e.g. contributions from permanent magnet generators will typically decay from 10 per unit to 3 per unit after 10 cycles).
- H. For each equipment location with a separately enclosed main device (where there is adequate separation between the line side terminals of the main protective device and the work location), calculations for incident energy and flash protection boundary shall include both the line and load side of the main breaker.
- I. When performing incident energy calculations on the line side of a main breaker (as required per above), the line side and load side contributions must be included in the fault calculation.
- J. Mis-coordination should be checked amongst all devices within the branch containing the immediate protective device upstream of the calculation location and the calculation should utilize the fastest device to compute the incident energy for the corresponding location.
- K. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. Maximum clearing time will be capped at 2 seconds based on IEEE 1584-2002 section.
- L. Where it is not physically possible to move outside of the flash protection boundary in less than 2 seconds during an arc flash event, a maximum clearing time based on the specific location shall be utilized.

2.6 REPORT SECTIONS

- A. Input data shall include, but not be limited to the following:
 - 1. Feeder input data including feeder type (cable or bus), size, length, number per phase, conduit type (magnetic or non-magnetic) and conductor material (copper or aluminum).
 - 2. Transformer input data, including winding connections, secondary neutral-ground connection, primary and secondary voltage ratings, kVA rating, impedance, % taps and phase shift.
 - 3. Reactor data, including voltage rating, and impedance.

4. Generation contribution data, (synchronous generators and Utility), including short-circuit reactance (X''_d), rated MVA, rated voltage, three-phase and single line-ground contribution (for Utility sources) and X/R ratio.
 5. Motor contribution data (induction motors and synchronous motors), including short-circuit reactance, rated horsepower or kVA, rated voltage, and X/R ratio.
- B. Short-Circuit Output Data shall include, but not be limited to the following reports:
1. Low Voltage Fault Report shall include a section for three-phase and unbalanced fault calculations and shall show the following information for each applicable location:
 - a. Voltage
 - b. Calculated fault current magnitude and angle
 - c. Fault point X/R ratio
 - d. Equivalent impedance
 2. Momentary Duty Report shall include a section for three-phase and unbalanced fault calculations and shall show the following information for each applicable location:
 - a. Voltage
 - b. Calculated symmetrical fault current magnitude and angle
 - c. Fault point X/R ratio
 - d. Calculated asymmetrical fault currents
 - e. Based on fault point X/R ratio
 - f. Based on calculated symmetrical value multiplied by 1.6
 - g. Based on calculated symmetrical value multiplied by 2.7
 - h. Equivalent impedance
 3. Interrupting Duty Report shall include a section for three-phase and unbalanced fault calculations and shall show the following information for each applicable location:
 - a. Voltage
 - b. Calculated symmetrical fault current magnitude and angle
 - c. Fault point X/R ratio
 - d. No AC Decrement (NACD) Ratio
 - e. Equivalent impedance
 - f. Multiplying factors for 2, 3, 5 and 8 cycle circuit breakers rated on a symmetrical basis
 - g. Multiplying factors for 2, 3, 5 and 8 cycle circuit breakers rated on a total basis
- C. Recommended Protective Device Settings:
1. Phase and Ground Relays:
 - a. Current transformer ratio
 - b. Current setting
 - c. Time setting
 - d. Instantaneous setting
 - e. Recommendations on improved relaying systems, if applicable.
 2. Circuit Breakers:
 - a. Adjustable pickups and time delays (long time, short time, ground)
 - b. Adjustable time-current characteristic

- c. Adjustable instantaneous pickup
 - d. Recommendations on improved trip systems, if applicable.
- D. Incident energy and flash protection boundary calculations
- 1. Arcing fault magnitude
 - 2. Protective device clearing time
 - 3. Duration of arc
 - 4. Arc flash boundary
 - 5. Working distance
 - 6. Incident energy
 - 7. Hazard Risk Category
 - 8. Recommendations for arc flash energy reduction

PART 3 - EXECUTION

3.1 GENERAL

- A. The short circuit study shall be performed with the aid of a computer program and shall be in accordance with the latest applicable IEEE and ANSI standards. For computer software, use SKM Systems latest edition of "Dapper" and "Captor" programs.
- B. In addition to the software generated printouts the report shall include a short circuit device evaluation table that lists all the equipment with their associated AIC ratings, X/R ratio, phase and ground fault levels, percentage of fault current vs. AIC rating.
- C. The study input data shall include the maximum available short circuit contribution, resistance and reactance components of the branch impedance, the X/R ratios, base quantities selected, and other source impedance.
- D. Short circuit close and latch duty values and interrupting duty values shall be calculated on the basis of maximum available current at each substation bus, switchgear bus, medium voltage controller, switchboard, low voltage motor control center, distribution panelboard, pertinent branch circuit panel and other significant locations through the system. The short circuit tabulations shall include asymmetrical fault currents, symmetrical fault currents, and X/R ratios. For each fault location, the total duty on the bus, as well as the individual contribution from each connected branch, shall be listed with its respective X/R ratio.
- E. A protective device evaluation study shall be performed to determine the adequacy of circuit breakers, fusible switches, automatic transfer switches, and fuses by tabulating and comparing the short circuit ratings of these devices with the calculated fault currents. Appropriate multiplying factors based on system X/R ratios and protective device rating standards shall be applied. Any problem areas or inadequacies in the equipment due to short circuit currents shall be promptly brought to the Commissioner's Representative's attention.
- F. Contractor shall obtain settings or AIC ratings for the packaged chiller and/or motor starters from Division 23 contractor.
- G. When emergency generator is provided, include phase and ground coordination of the generator protective devices. Show the generator decrement curve and damage curve along with the operating characteristic of the protective devices. Contractor shall obtain the

information from the generator manufacturer and include the generator actual impedance value, time constants and current boost data in the study. Do not use typical values for the generator.

3.2 PROTECTIVE DEVICE COORDINATION STUDY

- A. A protective device coordination study shall be performed to provide the necessary calculations and logic decisions required to select or to check the selection of power fuse ratings, protective relay characteristics and settings, ratios and characteristics of associated current transformers, ground fault relays and low voltage breaker trip characteristics and settings. The studies shall be in accordance with the latest applicable IEEE and ANSI standards.
- B. The coordination study shall include all medium and low voltage classes of equipment from the building or central plant service protective devices down to and including the largest rated device in the low voltage motor control centers and panelboards. The phase and ground overcurrent protection shall be included as well as settings of all other adjustable protective devices, including the ground fault system devices.
- C. The time-current characteristics of the specified protective devices shall be drawn on log-log paper. The plots shall include complete titles, representative one-line diagram and legends, significant motor starting characteristics, complete parameters of transformers, complete operating bands of low voltage circuit breaker trip curves and fuses. The coordination plots shall indicate the types of protective devices selected, proposed relay taps, time dial and instantaneous trip settings, transformer magnetizing inrush and ANSI transformer withstand parameters, cable thermal overcurrent withstand limits and significant symmetrical and asymmetrical fault currents. All restrictions of the National Electrical Code shall be adhered to and proper coordination intervals and separation of characteristic curves shall be maintained. The coordination plots for phase and ground protective devices shall be provided on a system basis. A sufficient number of separate curves shall be used to clearly indicate the coordination achieved.
- D. The selection and settings of the protective devices shall be provided separately in a tabulated form listing circuit identification, IEEE device number, current transformer ratios and connection, manufacturer and type, range of adjustment and recommended settings. A tabulation of the recommended power fuse selection shall be provided for the medium voltage fuses where applied in the system. Any discrepancies, problem areas, or inadequacies shall be promptly brought to the Commissioner's Representative's attention.

3.3 ARC FLASH WARNING LABELS

- A. The contractor of the Arc Flash Hazard Analysis shall provide a 3.5 in. x 5 in. thermal transfer type label of high adhesion polyester for each work location analyzed.
- B. All labels will be based on recommended overcurrent device settings and will be provided after the results of the analysis have been presented to the Commissioner and after any system changes, upgrades or modifications have been incorporated in the system.
- C. The label shall include the following information, at a minimum:
 - 1. Location designation
 - 2. Nominal voltage
 - 3. Flash protection boundary
 - 4. Hazard risk category

5. Incident energy
 6. Working distance
 7. Engineering report number, revision number and issue date.
- D. Labels shall be machine printed, with no field markings.
- E. Arc flash labels shall be provided in the following manner and all labels shall be based on recommended overcurrent device settings.
1. For each 600, 480 and applicable 208 volt panelboard, one arc flash label shall be provided.
 2. For each motor control center, one arc flash label shall be provided.
 3. For each low voltage switchboard, one arc flash label shall be provided.
 4. For each switchgear, one flash label shall be provided.
 5. For medium voltage switches one arc flash label shall be provided
- F. Labels shall be field installed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.

3.4 ARC FLASH TRAINING

- A. The contractor of the Arc Flash Hazard Analysis shall train the Commissioner's qualified electrical personnel of the potential arc flash hazards associated with working on energized equipment (minimum of 4 hours).

3.5 PROTECTIVE DEVICE TESTING, CALIBRATION AND ADJUSTMENT

- A. The equipment manufacturer shall provide the services of a qualified field engineer and necessary tools and equipment to test and calibrate the protective relays, ground fault relays and circuit breaker trip devices as recommended in the Study.

END OF SECTION 260573

SECTION 260800

COMMISSIONING OF ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this section.
- B. The OPR and BOD documentation are included by reference for information only.
- C. Division 01 section "Sustainable Design Requirements (LEED Building)" for additional LEED requirements.

1.2 SUMMARY

- A. This section includes commissioning process requirements for Electrical systems, assemblies, and equipment.
- B. Related Sections:
 - 1. Division 01 Section "General Commissioning Requirements" for general commissioning process requirements.

1.3 DESCRIPTION

- A. Commissioning: Commissioning is a systematic process of ensuring that all building systems, including the mechanical and electrical systems, have been installed in the prescribed manner, are functionally checked and capable of being operated and maintained to perform with the design intent and have documentation to support proper installation and operation. The Commissioning Agent (CxA) shall provide the City of New York with an unbiased, objective view of the system's installation, operation and performance. This process does not eliminate or reduce the responsibility of each system designer to provide a complete design or installing subcontractors to provide a finished product. Commissioning is intended to enhance the quality of each system installation, startup and transfer to beneficial use by the City of New York.
- B. Commissioning during the construction phase is intended to achieve the following specific objectives, according to the Contract Documents:
 - 1. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
 - 2. Verify and document proper performance of equipment and systems.
 - 3. Verify that Operation & Maintenance documentation is complete and transferred to City of New York.
 - 4. Verify that the City of New York's operating personnel are adequately trained.

5. Verify a contract is in place for a post occupancy review with O&M staff within 10 months after Substantial Completion.
- C. The Commissioning process shall be a team effort and encompass, as well as coordinate, the traditionally separate functions of system documentation, system installation, equipment startup, control system calibration, testing, balancing and verification and performance checkouts.
- D. The CxA will work closely with the construction team, cooperating on and coordinating all Cx activities with the CM, City of New York's representative, Trade Contractors, subcontractors, manufacturers and equipment suppliers.
- E. The Cx process shall not reduce the responsibility of the CM to comply with the Contract Documents.

1.4 DEFINITIONS

- A. Refer to Division 01 Section and "General Commissioning Requirements" for definitions.

1.5 SUBMITTALS

- A. Refer to Division 01 Section and "General Commissioning Requirements" for CxA's role.
- B. Refer to Division 01 Section "General Conditions" for specific requirements. In addition, provide the following:
- C. In addition, provide the following:
 1. Certificates of readiness
 2. Certificates of completion of installation, prestart, and startup activities.
 3. O&M manuals
 4. Test reports

1.6 QUALITY ASSURANCE

- A. Test Equipment Calibration Requirements: Contractors will comply with test equipment manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxA upon request.

1.7 COORDINATION

- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to coordination during the commissioning process.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

- A. All standard testing equipment required to perform startup, initial checkout and functional performance testing shall be provided by the Contractor for the equipment being tested. For example, the electrical contractor of Division 26 shall ultimately be responsible for all standard testing equipment for the electrical systems and controls systems in Division 26. A sufficient quantity of two-way radios shall be provided by each contractor.
- B. Special equipment, tools and instruments (specific to a piece of equipment and only available from vendor) required for testing shall be included in the base bid price to the City of New York and left on site, except for stand-alone data logging equipment that may be used by the CxA.
- C. Proprietary test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist in the commissioning process as needed. Proprietary test equipment (and software) shall become the property of the City of New York upon completion of the commissioning process.
- D. Data logging equipment and software required to test equipment will be provided by the CxA, but shall not become the property of the City of New York.
- E. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year.

PART 3 - EXECUTION

3.1 GENERAL DOCUMENTATION REQUIREMENTS

- A. With assistance from the installing contractors, the CxA will prepare Pre-Functional Checklists for all commissioned components, equipment, and systems
- B. Red-lined Drawings:
 - 1. The contractor will verify all equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawings.
 - 2. Preliminary red-lined drawings must be made available to the Commissioning Team for use prior to the start of Functional Performance Testing.
 - 3. Changes, as a result of Functional Testing, must be incorporated into the final as-built drawings, which will be created from the red-lined drawings.
 - 4. The contracted party, as defined in the Contract Documents will create the as-built drawings.
- C. Operation and Maintenance Data:
 - 1. Contractor will provide a copy of O&M literature within 45 days of each submittal acceptance for use during the commissioning process for all commissioned equipment and systems.
 - 2. The CxA will review the O&M literature once for conformance to project requirements.

3. The CxA will receive a copy of the final approved O&M literature once corrections have been made by the Contractor.

D. Demonstration and Training:

1. Contractor will provide demonstration and training as required by the specifications.
2. A complete training plan and schedule must be submitted by the Contractor to the CxA four weeks (4) prior to any training.
3. A training agenda for each training session must be submitted to the CxA one (1) week prior the training session.
4. The CxA shall be notified at least 72 hours in advance of scheduled tests so that testing may be observed by the CxA and City of New York's representative. A copy of the test record shall be provided to the CxA, City of New York, and Commissioner.
5. Engage a Factory-authorized service representative to train City of New York's maintenance personnel to adjust, operate, and maintain specific equipment.
6. Train City of New York's maintenance personnel on procedures and schedules for starting and stopping, trouble shooting, servicing, and maintaining equipment.
7. Review data in O&M Manuals.

3.2 CONTRACTOR'S RESPONSIBILITIES

- A. Perform commissioning tests as per the written procedure and at the direction of the CxA.
- B. Attend construction phase controls coordination meetings.
- C. Participate in Electrical systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.
- D. Provide information requested by the CxA for final commissioning documentation.
- E. Include requirements for submittal data, operation and maintenance data, and training in each purchase order or sub-contract written.
- F. Prepare preliminary schedule for Electrical system orientations and inspections, operation and maintenance manual submissions, training sessions, equipment start-up and task completion for City of New York. Distribute preliminary schedule to commissioning team members.
- G. Update schedule as required throughout the construction period.
- H. During the startup and initial checkout process, execute the related portions of the prefunctional checklists for all commissioned equipment.
- I. Perform all verification and functional performance tests in the presence of the CxA as required.
- J. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.

- K. Gather operation and maintenance literature on all equipment, and assemble in binders as required by the specifications. Submit to CxA 45 days after submittal acceptance.
- L. Coordinate with the CxA to provide 72-hour advance notice so that the witnessing of equipment and system start-up and testing can begin.
- M. Notify the CxA a minimum of two weeks in advance of the time for start of the testing work.
- N. Participate in, and schedule vendors and contractors to participate in the training sessions.
- O. Provide written notification to the CM/GCC and CxA that the following work has been completed in accordance with the contract documents, and that the equipment, systems, and sub-system are operating as required.
 - 1. Electrical equipment including switchgear, panel boards, motor control centers, lighting, receptacles, and all other equipment furnished under this Division.
 - 2. Fire alarm system
 - 3. Lighting System
- P. The equipment supplier shall document the performance of his equipment.
- Q. Provide a complete set of red-lined drawings to the CxA prior to the start of Functional Performance Testing.
- R. Provide training of the City of New York's operating staff using expert qualified personnel, as specified.
- S. Equipment Suppliers
 - 1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the City of New York, to keep warranties in force.
 - 2. Assist in equipment testing per agreements with contractors.
 - 3. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.
- T. Refer to Division 01 Section "General Commissioning Requirements" for additional Contractor responsibilities.

3.3 CITY OF NEW YORK'S RESPONSIBILITIES

- A. Refer to Division 01 Section "General Commissioning Requirements" for City of New York's Responsibilities.

3.4 DESIGN PROFESSIONAL'S RESPONSIBILITIES

- A. Refer to Division 01 Section "General Commissioning Requirements" for Design Professional's Responsibilities.

3.5 CxA'S RESPONSIBILITIES

- A. Refer to Division 01 Section "General Commissioning Requirements" for CxA's Responsibilities.

3.6 TESTING PREPARATION

- A. Certify in writing to the CxA that Electrical systems, subsystems, and equipment have been installed, megerred, calibrated, and started and are operating according to the Contract Documents.
- B. Certify in writing to the CxA that Electrical instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.
- C. Certify in writing that testing procedures have been completed and that testing reports have been submitted, discrepancies corrected, and corrective work approved.
- D. Place systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).
- E. Inspect and verify the position of each device and interlock identified on checklists.
- F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.
- G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

3.7 GENERAL TESTING REQUIREMENTS

- A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.
- B. Scope of Electrical testing shall include the entire Electrical installation, from the incoming power equipment throughout the distribution system. Testing shall include measuring, but not limited to resistance, voltage, and amperage of system(s) and devices.
- C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.
- D. The Electrical contractor and other contracted subcontractors, including the fire alarm Subcontractor shall prepare detailed testing plans, procedures, and checklists for Electrical systems, subsystems, and equipment with guidance from CxA.
- E. Tests will be performed using design conditions whenever possible.
- F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.
- G. The CxA may direct that set points be altered when simulating conditions is not practical.

- H. If tests cannot be completed because of a deficiency outside the scope of the Electrical system, document the deficiency and report it to the City of New York. After deficiencies are resolved, reschedule tests.
- I. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.8 ELECTRICAL SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

- A. Equipment Testing and Acceptance Procedures: Testing requirements are specified in individual Division 26 sections. Provide submittals, test data, inspector record, infrared camera and certifications to the CA.
- B. Electrical Instrumentation and Control System Testing: Field testing plans and testing requirements are specified in Division 26. Assist the CxA with preparation of testing plans.
- C. Fire Detection and Alarm System Testing: Provide technicians, instrumentation, tools and equipment to test performance of designated systems and devices at the direction of the CxA. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested.
- D. Electrical Distribution System Testing: Provide technicians, load banks, infrared cameras, instrumentation, tools and equipment to test performance of designated systems and devices at the direction of the CxA. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested
- E. The work included in the commissioning process involves a complete and thorough evaluation of the operation and performance of all components, systems and sub-systems. The scope of commissioning work shall include but not limited to the following equipment and systems :
 - 1. Fire Alarm System
 - 2. Lighting Controls
 - 3. Power Distribution System

3.9 DEFICIENCIES/NON-CONFORMANCE, COST OF RETESTING, FAILURE DUE TO MANUFACTURER DEFECT

- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to deficiencies/non-conformance, cost of retesting, or failure due to manufacturer defect.

3.10 APPROVAL

- A. Refer to Division 01 Section "General Commissioning Requirements" for approval procedures.

3.11 DEFERRED TESTING

- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to deferred testing.

3.12 OPERATION AND MAINTENANCE MANUALS

- A. The Operation and Maintenance Manuals shall conform to Contract Documents requirements as stated in Division 01.
- B. Refer to Division 01 Section "General Commissioning Requirements" for the AE and CxA roles in the Operation and Maintenance Manual contribution, review and approval process.

3.13 TRAINING OF CITY OF NEW YORK PERSONNEL

- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to training.
- B. Electrical Contractor. The electrical contractor shall have the following training responsibilities:
 - 1. Provide the CxA with a training plan two weeks before the planned training.
 - 2. Provide designated City of New York's personnel with comprehensive training in the understanding of the systems and the operation and maintenance of each major piece of commissioned electrical equipment or system.
 - 3. Training shall be recorded by the CxA and start with classroom sessions, if necessary, followed by hands on training on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.
 - 4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
 - 5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment is required. More than one party may be required to execute the training.
 - 6. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
 - 7. Training shall include:
 - a. Use the printed installation, operation and maintenance instruction material included in the O&M manuals.
 - b. Include a review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.
 - c. Discuss relevant health and safety issues and concerns.
 - d. Discuss warranties and guarantees.
 - e. Cover common troubleshooting problems and solutions.

- f. Explain information included in the O&M manuals and the location of all plans and manuals in the facility.
 - g. Discuss any peculiarities of equipment installation or operation.
8. Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and preventative maintenance of all pieces of equipment.
9. The electrical contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system.
10. Training shall occur after functional testing is complete, unless approved otherwise by the City of New York's.

END OF SECTION 260800

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SECTION 26 09 23 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following lighting control devices:
 - 1. Outdoor photoelectric switches.
 - 2. Indoor occupancy sensors.
- B. Related Sections include the following:
 - 1. Division 26 Section "Network Lighting Controls" for low-voltage, manual and programmable lighting control systems.
 - 2. Division 26 Section "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.3 DEFINITIONS

- A. LED: Light-emitting diode.
- B. PIR: Passive infrared.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show installation details for occupancy and light-level sensors.
 - 1. Interconnection diagrams showing field-installed wiring.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 COORDINATION

- A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 OUTDOOR PHOTOELECTRIC SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Lithonia Lighting; Acuity Lighting Group, Inc.
 2. Novitas, Inc.
 3. Square D; Schneider Electric.
 4. TORK.
 5. Watt Stopper (The).
- B. Description: Solid state, with DPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.

1. Light-Level Monitoring Range: 20 to 1000 lux, with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of photocell to prevent fixed light sources from causing turn-off.
2. Time Delay: 15-second minimum, to prevent false operation.
3. Surge Protection: Metal-oxide varistor, complying with IEEE C62.41.1, IEEE C62.41.2, and IEEE 62.45 for Category A1 locations.
4. Mounting: Twist lock complying with IEEE C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.

2.2 INDOOR OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Hubbell Lighting.
 2. Leviton Mfg. Company Inc.
 3. Lithonia Lighting; Acuity Lighting Group, Inc.
 4. Sensor Switch, Inc.
 5. Watt Stopper (The).

- B. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.
1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 5 to 20 minutes.
 2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
 3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
 4. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 13-mm knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
 6. Bypass Switch: Override the on function in case of sensor failure.
 7. Automatic Light-Level Sensor: Adjustable from 20 to 2000 lux; keep lighting off when selected lighting level is present.
- C. Ultrasonic Type: Ceiling mounting; detect occupancy by sensing a change in pattern of reflected ultrasonic energy in area of coverage.
1. Detector Sensitivity: Detect a person of average size and weight moving not less than 305 mm in either a horizontal or a vertical manner at an approximate speed of 305 mm/s.
 2. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 186 sq. m when mounted on a 2440-mm-high ceiling.
- D. Dual-Technology Type: Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on-off functions shall be selectable in the field by operating controls on unit.
1. Sensitivity Adjustment: Separate for each sensing technology.
 2. Detector Sensitivity: Detect occurrences of 150-mm-minimum movement of any portion of a human body that presents a target of not less than 232 sq. cm, and detect a person of average size and weight moving not less than 305 mm in either a horizontal or a vertical manner at an approximate speed of 305 mm/s.
 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 93 sq. m when mounted on a 2440-mm-high ceiling.
- E. Switch Integral Type: Wall mounted to switch box with integral toggle control, detecting occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage.
1. Sensor shall utilize Dual Sensing Verification Principle for coordination between ultrasonic and PIR technologies to reduce likelihood of false operations.
 2. Sensor shall feature a trigger mode where the end-user can choose which technology will activate the sensor from off mode (initial), the type of detection that will reset the time delay (maintain), and the type of detection that will cause the sensor to be turned back on immediately after lights turned off due to lack of motion (re-trigger). Selection of technologies for initial, maintain, and re-trigger shall be done with DIP switches.

3. Sensor shall have its trigger mode factory preset to allow for quick installation in most applications. In this default setting, both technologies must occur in order to initially activate lighting systems. Detection by either technology shall maintain lighting on, and detection by either technology shall turn lights back on after lights were turned off for five seconds or less in automatic mode and 30 seconds or less in manual mode.
4. Robotic test method as referred in the NEMA WD 7 guide shall be utilized for minor motion coverage verification.
5. Ultrasonic sensing shall be volumetric in coverage with a frequency of 40 KHz. It shall utilize Advanced Signal Processing which automatically adjusts the detection threshold dynamically to compensate for constantly changing levels of activity and air flow throughout controlled space.
6. The PIR technology shall utilize a temperature compensated, dual element sensor and a multi-element Fresnel lens. The lens shall be Poly IR4 material to offer superior performance in the infrared wavelengths and filter short wavelength IR, such as those emitted by the sun and other visible light sources. The lens shall have grooves facing in to avoid dust and residue build up which affects IR reception.
7. Sensor shall utilize automatic adjustment technology to optimize automatic time delay to fit occupant usage patterns. The use of automatic adjustment technology shall be selectable with a DIP switch.
8. Sensor shall utilize Zero Crossing circuitry.
9. Sensor shall have no minimum load requirement and shall be capable of switching from 0 to 800 Watt incandescent; 0 to 800 Watt fluorescent or 1/6 hp @ 120 VAC, 60Hz; and 0 to 1200 Watt fluorescent at 277 VAC, 60Hz.

2.3 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than as recommended by device or system manufacturer. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than as recommended by device or system manufacturer. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

- A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 CONTACTOR INSTALLATION

- A. Mount electrically held lighting contactors with elastomeric isolator pads, to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

- A. Wiring Method: Comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size shall be 13 mm.
- B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

- A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."
 - 1. Identify controlled circuits in lighting contactors.
 - 2. Identify circuits or luminaries controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
 - 2. Operational Test: Verify operation of each lighting control device, and adjust time delays.
- B. Lighting control devices that fail tests and inspections are defective work.

3.6 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train City of New York's maintenance personnel to adjust, operate, and maintain lighting control devices. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 26 09 23

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SECTION 26 09 43 - NETWORK LIGHTING CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes individually addressable lighting control devices communicating with data-entry and -retrieval devices using DALI protocol.
- B. Related Sections:
 - 1. Division 26 Section "Lighting Control Devices" for time clocks, photoelectric sensors, occupancy sensors, and multipole contactors.

1.3 DEFINITIONS

- A. BACnet: A networking communication protocol that complies with ASHRAE 135.
- B. BAS: Building automation system.
- C. DALI: Digital addressable lighting interface.
- D. LonWorks: A control network technology platform for designing and implementing interoperable control devices and networks.
- E. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling and power-limited circuits.
- F. Monitoring: Acquisition, processing, communication, and display of equipment status data, metered electrical parameter values, power quality evaluation data, event and alarm signals, tabulated reports, and event logs.
- G. PC: Personal computer; sometimes plural as "PCs."
- H. Power Line Carrier: Use of radio-frequency energy to transmit information over transmission lines whose primary purpose is the transmission of power.
- I. RS-485: A serial network protocol, similar to RS-232, complying with TIA-485-A.
- J. UTP: Unshielded twisted pair.

1.4 LIGHTING CONTROL NARRATIVE

- A. As indicated on the drawings, all public spaces, open spaces, and theatre interior house lighting shall be controlled by a DALI based networked digital ballast system.

- B. The DALI digital networked system shall be linked to the theatrical lighting control system to allow the theatrical lighting control system to control all linked lighting in the lobby spaces and theatre interior.
- C. The DALI system shall all house lighting zones to be configurable through the theatrical lighting system.
- D. The lighting control system shall allow lockout of individual pushbutton stations from a central location.
- E. All enclosed back of house and office lighting shall be controlled by standalone wall switches and/or occupancy sensors as indicated on drawings.
- F. All control rooms lighting be controlled by standalone wallbox dimmer switches as indicated on drawings.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for control modules, power distribution components, DALI network materials, manual switches and plates, and conductors and cables.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Outline Drawings: Indicate dimensions, weights, arrangement of components, and clearance and access requirements.
 - 3. Block Diagram: Show interconnections between components specified in this Section and devices furnished with power distribution system components. Indicate data communication paths and identify networks, data buses, data gateways, concentrators, and other devices to be used. Describe characteristics of network and other data communication lines.
 - 4. Wiring Diagrams: For power, signal, and control wiring. Coordinate nomenclature and presentation with a block diagram.
- C. Coordination Drawings: Submit evidence that lighting controls are compatible with connected monitoring and control devices and systems specified in other Sections.
 - 1. Show interconnecting signal and control wiring and interfacing devices that prove compatibility of inputs and outputs.
 - 2. For networked controls, list network protocols and provide statements from manufacturers that input and output devices meet interoperability requirements of the network protocol.
- D. Software and Firmware Operational Documentation:
 - 1. Software operating and upgrade manuals.
 - 2. Program Software Backup: On a magnetic media or compact disc, complete with data files.
 - 3. Device address list.
 - 4. Printout of software application and graphic screens.

- E. Field quality-control reports.
- F. Software licenses and upgrades required by and installed for operation and programming of digital and analog devices.
- G. Operation and Maintenance Data: For lighting controls to include in emergency, operation, and maintenance manuals.
- H. Warranty: Sample of special warranty.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain lighting control module and power distribution components through one source from a single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with 47 CFR, Subparts A and B, for Class A digital devices.
- D. Comply with protocol described in IEC 60929, Annex E, for DALI lighting control devices, wiring, and computer hardware and software.
- E. Comply with NFPA 70.

1.7 COORDINATION

- A. Coordinate lighting control components to form an integrated interconnection of compatible components.
 - 1. Match components and interconnections for optimum performance of lighting control functions.
 - 2. Coordinate lighting controls with BAS and HVAC controls. Design display graphics showing building areas controlled; include the status of lighting controls in each area.
 - 3. Coordinate lighting controls with that in Sections specifying distribution components that are monitored or controlled by power monitoring and control equipment.
- B. Coordinate lighting control components specified in this Section with components specified in Division 26 Section "Panelboards."

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of lighting controls that fail in materials or workmanship or from transient voltage surges within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of software input/output to execute switching or dimming commands.
 - b. Failure of modular relays to operate under manual or software commands.
 - c. Damage of electronic components due to transient voltage surges.
 - 2. Warranty Period: Two years from date of Substantial Completion.
 - 3. Extended Warranty Period Failure Due to Transient Voltage Surges: Eight years.

4. Extended Warranty Period for Electrically Held Relays: 10 years from date of Substantial Completion.

1.9 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Electrically Held Relays: Equal to five percent of amount installed for each size indicated, but no fewer than ten relays.
 2. Electrically Operated, Molded-Case Circuit Breakers: Equal to five percent of amount installed for each size indicated, but no fewer than ten circuit breakers.

1.10 SOFTWARE SERVICE AGREEMENT

- A. Technical Support: Beginning with Substantial Completion, provide software support for one year.
- B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of the software.
 1. Provide 30 days' notice to City of New York to allow scheduling and access to system and to allow City of New York to upgrade computer equipment if necessary.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. ETC – Electronic Theater Controls.
 2. Lutron Electronics Co., Inc.

2.2 SYSTEM REQUIREMENTS

- A. Expandability: System shall be capable of increasing the number of control functions in the future by 25 percent of current capacity; to include equipment ratings, housing capacities, spare relays, terminals, number of conductors in control cables, and control software.
- B. Performance Requirements: Individually addressable devices (such as electronic ballasts, dimmers, and manual switches) are operated from digital signals received through a DALI-compliant bus, from data-entry and -retrieval devices (such as PCs, personal digital assistants (PDAs), hand-held infrared programming devices, wired Ethernet hubs, wireless IEEE 802.11 hubs. Devices also report status to data-entry and -retrieval devices through the bus.
- C. BAS Interface: Provide hardware and software to enable the BAS to monitor, control, display, and record data for use in processing reports.
 1. ASHRAE 135 (BACnet), LonTalk, Modbus, or Industry-accepted, open-protocol communication interface to be determined with the BAS shall enable the BAS operator to

remotely control and monitor lighting from a BAS operator workstation. Control features and monitoring points displayed locally at lighting panel shall be available through the BAS.

2.3 CONTROL MODULE

- A. Control Module Description: Programmable, PC-based unit with 17-inch color LCD and keyboard for graphic display and programming of system status and to override breaker status; and to display status of local override controls and diagnostic information. If the control module is applied to emergency lighting units, control unit shall indicate failure of normal power and that the lighting units are, or are not, powered by the alternate power source.
1. Display: Single graphic display for programming lighting control panelboards.
 2. Interoperability: Lighting control shall be configured to allow individual users to turn lighting on and off with DALI-compliant, digital-communication devices. Software shall be written for Windows operating system, with the full suite of DALI commands and device parameter settings.
 3. System Memory: Nonvolatile. System shall reboot program and reset time automatically without errors after power outages up to 90 days' duration.
 4. Software: Lighting control software shall be capable of linking switch inputs to relay outputs, retrieving links, viewing relay output status, controlling relay outputs, simulating switch inputs, setting device addresses, and assigning switch input and relay output modes.
 5. Automatic Time Adjustment: System shall automatically adjust for leap year and daylight saving time and shall provide weekly routine and annual holiday scheduling.
 6. Astronomic Control: Automatic adjustment of dawn and dusk switching.
 7. Demand Control: Demand shall be monitored through pulses from a remote meter and shall be controlled by programmed switching of loads. System capability shall include sliding window averaging and programming of load priorities and characteristics. Minimum of two different time-of-day demand schedules shall execute load-management control actions by switching output circuits or by transmitting other types of load-control signals.
 8. Confirmation: Each relay or contactor device operated by system shall have auxiliary contacts that provide a confirmation signal to the system of on or off status of device. On or off status confirmation for each electrically operated circuit breaker shall be provided by an auxiliary contact or by a sensing device at load terminal.
 - a. Software shall interpret status signals, provide for their display, and initiate failure signals.
 9. Remote Communication Capability: Allow programming, data-gathering interrogation, status display, and controlled command override from a PC at a remote location over data links and DALI networks. System shall include modem, communications and control software, and remote computer compatibility verification for this purpose.
 10. Telephone Override Capability: Override programmed lighting shutdown commands by telephoning computer and entering a voice-menu-guided, override touch-tone code specific to zone being controlled.
 11. Local Override Capability: Manual, low-voltage control devices shall override programmed shutdown of lighting and shall override other programmed control for intervals that may be duration programmed.
 12. Automatic Control of Local Override: Automatic control shall switch lighting off if lighting has been switched on by local override.
 13. Automatic battery backup shall provide power to maintain program and system clock operation for 90 days' minimum duration when power is off.
 14. Programmed time signals shall change preset scenes and dimmer settings.

15. Daylight Balancing Dimming Control: Control module shall interpret variable analog signal from photoelectric sensor and shall route dimming signals to dimming fluorescent ballast control circuits. Signal shall control dimming of fixture so illumination level remains constant as daylight contribution varies.
16. Daylight Compensating Switch Control: Control module shall interpret a preset threshold illumination-level signal from a photoelectric relay and shall activate relays controlling power to selected groups of lighting fixtures to turn them on and off to maintain adjustable minimum illumination level as daylight contribution varies.
17. Energy Conservation: Bilevel control of special ballasts or dimming circuits to comply with local energy codes.
18. Flick Warning: Programmable momentary turnoff of lights shall warn that programmed shutoff will occur after a preset interval. Warning shall be repeated after a second preset interval before end of programmed override period.
19. Diagnostics: When system operates improperly, software shall initiate factory-programmed diagnosis of failure and display messages identifying problem and possible causes.
20. Additional Programming: In addition to system programming by the PC, individual control modules shall be networked and programmable using data-entry and -retrieval (such as PCs, personal digital assistants (PDAs), hand-held infrared programming devices, wired Ethernet hubs, and wireless IEEE 802.11 hubs).

2.4 POWER DISTRIBUTION COMPONENTS

- A. Modular Relay Panel: Comply with UL 508 (CAN/CSA C22.2, No. 14) and UL 916 (CSA C22.2, No. 205); factory assembled with modular single-pole relays, power supplies, and accessory components required for specified performance.
 1. Cabinet: Steel with hinged, locking door.
 - a. Barriers separate low-voltage and line-voltage components.
 - b. Directory: Mounted on back of door. Identifies each relay as to load groups controlled and each programmed pilot device if any.
 - c. Control Power Supply: Transformer and full-wave rectifier with filtered dc output.
 2. Single-Pole Relays: Mechanically held unless otherwise indicated; split-coil, momentary-pulsed type.
 - a. Low-Voltage Leads: Plug connector to the connector strip in cabinet and pilot light power where indicated.
 - b. Rated Capacity (Mounted in Relay Panel): 20 A, 125-V ac for tungsten filaments; 20 A, 277-V ac for ballasts.
 - c. Endurance: 50,000 cycles at rated capacity.
 - d. Mounting: Provision for easy removal and installation in relay cabinet.
- B. Electrically Operated, Molded-Case Circuit-Breaker Panelboard: Comply with NEMA PB 1 and UL 50 (CAN/CSA C22.2, No. 94), UL 67 (CSA C22.2, No. 29), UL 489 (CAN/CSA C22.2, No. 65), and UL 916 (CSA C22.2, No. 205).
 1. Cabinets: In addition to requirements specified below, comply with Division 26 Section "Panelboards."
 2. Electrically Operated, Molded-Case Circuit Breakers: Bolt-on type.
 - a. Switching Endurance Ratings: Certified by manufacturer or by a nationally recognized testing laboratory (NRTL) for at least 20,000 open and close operations under rated load at 0.8 power factor.

- b. Minimum 30,000 open and close operations with load equal to circuit-breaker trip rating and consisting of 100 percent tungsten filament load.
 - c. Minimum 30,000 open and close operations with load equal to circuit-breaker trip rating and consisting of 100 percent fluorescent ballasts rated for 10 percent total harmonic distortion.
 - d. Listed and labeled as complying with UL SWD, HCAR, and HID ratings by an NRTL acceptable to authorities having jurisdiction.
- C. Line-Voltage Surge Suppression: Factory installed as an integral part of 120- and 277-V ac, solid-state control panels or field-mounting surge suppressors that comply with Division 26 Section "Transient-Voltage Suppression for Low-Voltage Electrical Power Circuits" for Category A locations.

2.5 DALI NETWORK MATERIALS

- A. Network Power Supply and Router: Interface device connecting TCP/IP control networks to DALI-compliant network.
- 1. DALI-Compliant Network Power Rating: Two full-rated networks, each capable of powering up to 64 addressable devices for each network; suitable for use with NFPA 70, Class 1 and Class 2 control circuits; and 16 V dc, 250 mA.
 - 2. Primary Power: 120 or 277 V, field selectable; 12 VA.
 - 3. 10basT Ethernet port.
 - 4. LED indicator lights for Ethernet status (link, send, and receive), power-on, and DALI network failure.
- B. Lighting Control Software:
- 1. Five-tier hierarchical architecture; high-speed, parallel query; and distributed-logic processing scalable from single rooms to full campuses.
 - 2. Automatic backup for all settings and parameters.
 - 3. TCP/IP network protocol.
 - 4. Interactive with other building management systems at TCP/IP level.
 - 5. At least three security levels.
 - 6. Support the full suite of DALI commands and device parameter settings.
 - 7. Scheduling modules to provide building-wide scene scheduling.
 - 8. Billing modules to track energy use for multiple tenants and able to produce monthly billing statements.
 - 9. Support load shedding, peak shaving, sweeps with local override, and other energy-conservation measures.
 - 10. Able to report individual device status, including inoperative lamps, ballast failure detection, and dimmer position.

2.6 MANUAL ANALOG SWITCHES AND PLATES

- A. Push-Button Switches: Modular, momentary-contact, low-voltage type.
- 1. Match color specified in Division 26 Section "Wiring Devices."
 - 2. Integral green LED pilot light to indicate when circuit is on.
 - 3. Internal white LED locator light to illuminate when circuit is off.
- B. Manual, Maintained Contact, Full- or Low-Voltage Switch: Comply with Division 26 Section "Wiring Devices."

- C. Wall-Box Dimmers: Comply with Division 26 Section "Wiring Devices."
- D. Wall Plates: Single and multigang plates as specified in Division 26 Section "Wiring Devices."
- E. Legend: Engraved or permanently silk-screened on wall plate where indicated. Use designations indicated on Drawings.

2.7 FIELD-MOUNTED DIGITAL CONTROLS AND PLATES

- A. Connection Type: RS-485 protocol, category 5 or 5e UTP cable, using RJ45 connectors. Power shall be from the control unit.
- B. Pushbutton Switches: Modular, solid-state, programmable, digital, momentary contact, designed to connect to a microprocessor based control unit as a manual control source.
 - 1. Mounting: Standard single-gang recessed switchbox, using device plates specified in Division 26 Section "Wiring Devices."
 - 2. Multi-Gang Mounting: One to six pushbuttons per gang.

2.8 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Class 2 Power Source: Not smaller than No. 12 AWG, complying with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cables: Stranded copper, complying with UL 83, multiconductor cable with copper conductors not smaller than No. 18 AWG, complying with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cables: Stranded copper, complying with UL 83, multiconductor cable with copper conductors not smaller than No. 14 AWG, complying with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- D. Structured Network Digital and Multiplexed Signal Cables: UTP cable with copper conductors, complying with TIA/EIA-568-B.2, Category 6 for horizontal copper cable and with Division 27 Section "Communications Horizontal Cabling."
- E. RS-485 Cables:
 - 1. Standard Cable: NFPA 70, Type CM or CMG.
 - a. Paired, 2 pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors.
 - b. PVC insulation.
 - c. Unshielded.
 - d. PVC jacket.
 - e. Flame Resistance: Comply with UL 1581.
 - 2. Plenum-Rated Cable: NFPA 70, Type CMP.
 - a. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
 - b. Fluorinated ethylene propylene insulation.
 - c. Unshielded.
 - d. Fluorinated ethylene propylene jacket.
 - e. Flame Resistance: NFPA 262, Flame Test.

PART 3 - EXECUTION

3.1 WIRING INSTALLATION

- A. Comply with NECA 1.
- B. Wiring Method: Install wiring in raceways. Minimum conduit size shall be 1/2 inch (13 mm).
 - 1. For power wiring comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables"
 - 2. For digital data transmission and low-voltage (operating at less than 50 V) remote control and signaling cables, comply with Division 26 Section "Control-Voltage Electrical Power Cables"
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and non-power-limited conductors according to conductor manufacturer's written instructions.
- D. Install field-mounting transient voltage suppressors for lighting control devices in Category A locations that do not have integral line-voltage surge protection.
- E. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
- F. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in terminal cabinets, equipment enclosures, and in junction, pull, and outlet boxes.
- G. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."

3.2 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Tests and Inspections:
 - 1. Test for circuit continuity.
 - 2. Verify that the control module features are operational.
 - 3. Check operation of local override controls.
 - 4. Test system diagnostics by simulating improper operation of several components selected by Architect.
- D. Lighting controls will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.3 SOFTWARE INSTALLATION

- A. Install and program software with initial settings of adjustable values. Make backup copies of software and user-supplied values. Provide current licenses for software.

3.4 ADJUSTING

- A. Occupancy Adjustments: When requested within 24 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to six visits to Project during other-than-normal occupancy hours for this purpose.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train City of New York's maintenance personnel to adjust, operate, and maintain lighting controls and software training for PC-based control systems.

END OF SECTION 26 09 43

SECTION 262200 - LOW VOLTAGE DISTRIBUTION TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes labor, materials and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:
1. Dry type ventilated transformers.
- B. Related Work: Consult all other Sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete installation.

1.2 REFERENCES

- A. Comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified.
1. ANSI C57 Pertaining to Power/Distribution Transformer.
 2. ANSI/NEMA ST 1 Specialty Transformers
 3. NEMA ST 20 Dry Type Transformers for General Applications.
 4. NEMA TP 1
 5. NEMA TP 2

1.3 SUBMITTALS

- A. Submit in accordance with the requirements of Section 260500, the following items:
1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.
 2. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.
 3. Shop drawings: Include type and style, dimensions, insulation class, windings material, rated temperature rise, taps provided, voltage, KVA, and impedance ratings and characteristics, loss data, efficiency at 25, 50, 75 and 100 percent rated load, sound level and electrical test reports.
 4. Submit manufacturer's installation instructions.
 5. Efficiency data under load profile up to K20 at 25%, 50%, 75% and 100% of nameplate rating.
 6. EMF test result at full rated current

1.4 QUALITY ASSURANCE

- A. All materials, equipment and parts comprising the units specified herein shall be new.
1. Contractor shall pay for the services of a qualified testing laboratory to perform the specified tests. The Contractor shall notify the City of New York's Representative at least five (5) working days in advance of performance of work requiring testing. The Contractor shall provide all material required for testing

1.5 STORAGE AND HANDLING

- A. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from potential damage from weather and construction operations. Store so condensation will not form on or in the transformer housing and if necessary, apply temporary heat where required to obtain suitable service conditions.
- B. Handle transformer using proper equipment for lifting and handling, use when necessary lifting eye and/or brackets provided for that purpose.

1.6 WARRANTY

- A. Equipment and components offered under this Section shall be covered by one (1) year parts and labor warranty for malfunctions resulting from defects in materials and workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Powersmiths
 - 2. Culter Hammer
 - 3. Square D

2.2 GENERAL

- A. Copper-wound, 3-phase, common core, ventilated, dry-type, isolation transformer built to NEMA ST20 and relevant NEMA, UL and IEEE standards; shall be U.L. and CSA Listed and bear the label.
- B. All terminals, including those for changing taps, must be readily accessible by removing a front cover plate. Windings shall be continuous with terminations brazed or welded.
- C. Provide ground bar kit and neutral to ground bond jumper terminated at ground bar. Provide mechanical lugs mounted on the ground bar for input ground bond, output ground bond and external ground.

2.3 BASIC REQUIREMENTS:

- A. Type: ANN, convection air cooled
- B. Insulation Class: 220°C system
- C. Temperature rise: 130°C
- D. Taps: $2 \times \pm 2.5\%$ (2FCAN, 2FCBN)
- E. Core construction: high grade non-aging, fully processed silicon steel laminations or better
- F. Coil conductors: continuous copper windings, with terminations brazed or welded up to 75kVA and bolted 112.5 kVA and up.

- G. Inrush current: 10 times full load rating (max.)
- H. Excitation current: 5% of full load current rating (max.)
- I. Enclosure: Ventilated NEMA 3R enclosure designed to prevent hand or rod contact with live parts.
- J. Enclosure Finish: ANSI 61 Grey suitable for UL50.
- K. Anti-vibration pads shall be used between the core and the enclosure
- L. All transformers shall include vibration isolation as specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- M. Transformer shall be UL listed.
- N. Ground core & coil assembly to enclosure with a flexible copper grounding strap or equivalent.
- O. Mounting:
 - 1. Ventilated units up to 750 lbs.: Suitable for wall, floor or ceiling mounting (drip plate required).
 - 2. Ventilated units over 750 lbs.: Suitable for floor mounting only.
- P. EMF level, not to be higher than 10mG top, 10mG side and 10mG at one meter.
- Q. Enclosures shall be fabricated of heavy gage sheet steel construction. Enclosure shall have suitable ventilating openings. Enclosure shall be provided with lifting lugs and jacking plates as required.
- R. Transformers shall be furnished complete with mounting channels and mounting bolts. Metal parts, excepting cores and core mounting frames shall be cleaned, rust-proofed and be given a heavy coating of an inert primer.
- S. All transformers shall have a basic impulse insulation level of 10 KV. The following tests shall be done at the factory:
 - 1. Applied voltage test to each winding and from each winding to ground.
 - 2. Induced voltage test - two times normal voltage.
 - 3. Ratio, polarity and sound level: Sound level tests shall be performed in test rooms with an ambient sound level not exceeding 24 dBs.
- T. Sound levels shall meet NEMA ST-20 and not exceed the following linear sound pressure levels (Lp) as measured at 3-ft from the transformer:
 - 1. 15-50 KVA - 45 dB
 - 2. 51-150 KVA - 50 dB
 - 3. 151 to 300 KVA - 55 dB
 - 4. 301 to 500 KVA - 60 dB
- U. Transformers shall have a minimum overload capacity per ANSI Standard. Certified temperature test of electrical duplicate units shall be supplied upon request.

- V. Terminal compartments for both primary and secondary lines shall be located in the bottom of the transformer to ensure termination of cable leads in ambient temperature levels and to provide for side or bottom entrance of conduit.

2.4 NEMA TP-1 ENERGY EFFICIENT DRY TYPE TRANSFORMER E-SAVER

- A. Copper-wound, 3-phase, common core, ventilated, dry-type, isolation transformer built to NEMA ST20 and relevant NEMA, UL and IEEE standards. All terminals, including those for changing taps, must be readily accessible by removing a front cover plate. Windings shall be continuous with terminations brazed or welded. 10kV BIL.
- B. 200% rated neutral, UL Listed & Labeled K-Rating: K-7 or higher.
- C. Insulation System:
1. Shall be NOMEX-based with an Epoxy Co-polymer impregnant for lowest environmental impact, long term reliability and long life expectancy
 2. Class: 220 degrees C
 3. Impregnant Properties for low emissions during manufacturing, highest reliability and life expectancy.
 4. Epoxy co-polymer
 5. VOC: less than 1.65 lbs/gal (low emissions during manufacturing)
- D. Maximum No Load Losses shall not exceed:
- a. 15kVA: 60W
 - b. 30kVA: 99W
 - c. 45kVA: 130W
 - d. 75kVA: 180W
 - e. 112.5kVA: 260W
 - f. 150kVA: 330W
 - g. 225kVA: 450W
 - h. 300kVA: 560W
 - i. 500kVA: 850W
 - j. 750kVA: 1200W
- E. Efficiency at 1/6 loading shall meet or exceed:
- a. 15kVA: 97.0%
 - b. 30kVA: 97.6%
 - c. 45kVA: 97.8%
 - d. 75kVA: 98.3%
 - e. 112.5kVA: 98.5%
 - f. 150kVA: 98.4%
 - g. 225kVA: 98.6%
 - h. 300kVA: 98.7%
 - i. 500kVA: 98.8%
 - j. 750kVA: 98.9%

- F. Shall meet or exceed DOE 10 CFR Part 430 CSL 3 Efficiency requirement, tested per NEMA TP-2:
- a. 15kVA: 97.6%
 - b. 30kVA: 98.1%
 - c. 45kVA: 98.3%
 - d. 75kVA: 98.6%
 - e. 112.5kVA: 98.8%
 - f. 150kVA: 98.9%,
 - g. 225kVA: 98.9%
 - h. 300kVA: 99.0%
 - i. 500kVA: 99.1%
 - j. 750kVA: 99.2%
- G. Efficiency under k-7 nonlinear load at 50% of nameplate rating:
- a. 15kVA: 97.2%
 - b. 30kVA: 97.7%
 - c. 45kVA: 97.9%
 - d. 75kVA: 98.1%
 - e. 112.5kVA: 98.5%
 - f. 150kVA: 98.7%
 - g. 225kVA: 98.8%
 - h. 300kVA: 98.8%
 - i. 500kVA: 98.9%
 - j. 750kVA: 99.1%
- H. Impedance: Between 3.5% and 5.8% unless otherwise noted.
- I. Enclosure type: NEMA 2, drip-proof.
- J. Maximum Footprint for 130 degree C rise model in a NEMA 1 enclosure: 33" Wide x 22" Deep x 40" High.

2.5 ISOLATED GROUND TRANSFORMER OPTIONS

- A. Electrostatic Shield: Each winding is independently single shielded with a full-width copper electrostatic shield for
- B. TVSS: UL 1449 listed, with EMI/RFI Filtering. Rating: 90kA/mode
- C. Lug Kit: Supply with standard screw-type lugs

2.6 HARMONIC CANCELLATION TRANSFORMER T-1000

- A. Copper-wound, 3-phase, common core, ventilated, dry-type, isolation transformer built to NEMA ST20 and relevant NEMA, UL and IEEE standards; 200% rated neutral; 60Hz rated; Transformers shall be U.L. and CSA Listed and bear the label. Terminal, including those for changing taps, must be readily accessible. Windings shall be continuous with terminations brazed or welded. 10kV BIL.
- B. Insulation System:
 - 1. Shall be NOMEX-based with an Epoxy Co-polymer impregnant for lowest environmental impact, long term reliability and long life expectancy

2. Class: 220 degrees C
 3. Impregnant Properties for low emissions during manufacturing, highest reliability and life expectancy
 4. Epoxy co-polymer
 5. VOC: less than 1.65 lbs/gal (low emissions during manufacturing)
 6. Water absorption (24hrs @25C): less than 0.05% (superior insulation, longer life)
 7. Chemical Resistance: Must have documented excellent performance rating by supplier
 8. Dielectric Strength: minimum of 3200 volts/mil dry (for superior stress, overvoltage tolerance)
 9. Dissipation Factor: max. 0.02 @25C to reduce aging of insulation, extending useful life
- C. Noise levels:
1. Per NEMA ST-20
 2. Production Test every unit. Data to be available upon request.
- D. Voltage Taps: For transformers 30kVA-300kVA, provide two 2-1/2% full capacity taps above and below nominal primary voltage. For transformers 15kVA and smaller as well as 500kVA and larger provide one 5% full capacity tap above and below nominal primary voltage.
- E. Operating Temperature Rise: 115 deg. C in a 40 deg. C maximum ambient 80 deg. C
- F. Positive/Negative Sequence Impedance: Between 3.0% and 5.5% unless otherwise specified by customer.
- G. Zero sequence impedance/reactance
1. As tested per ANSI/IEEE C57.12.91-1995, section 9.5.1 Zero-phase-sequence impedance tests of three-phase transformers
 2. Zero sequence reactance: less than 0.3%
 3. Zero sequence impedance (maximum): 0.95% for 112.5kVA and larger, 75kVA: 1.0%, 45kVA: 1.2%, 30kVA: 1.3%, 15kVA: 1.8%
- H. 3rd harmonic treatment: zero sequence currents not coupled into primary delta winding.
- I. 5th and 7th harmonics are treated through the pairing of phase-shifted models of transformer such that these harmonic currents, when produced by similar sources, subtract at the common bus feeding the transformers.
- J. Voltage Distortion: Change in voltage THD between transformer primary and secondary terminals shall be minimized so as to meet IEEE-519 when implemented on a system basis.
- K. Shall reduce the phase current imbalance on the primary side of the transformer
- L. Electrostatic Shield: Each winding is independently single shielded with a full-width copper electrostatic shield.
- M. Enclosure type: Ventilated NEMA 2, drip-proof
- N. Maximum Footprint for 115 degree C rise model in a NEMA 1 enclosure:
1. 17" Wide x 17" Deep x 27" High for 15kVA.
 2. 25" Wide x 18" Deep x 30" High for 30kVA, 45kVA
 3. 31" Wide x 22" Deep x 40" High for 75kVA, 112.5kVA

4. 37" Wide x 27" Deep x 52" High for 150kVA
5. 37" Wide x 32" Deep x 52" High for 225kVA, 300kVA
6. 52" Wide x 38" Deep x 61" High for 500kVA
7. 64" Wide x 47" Deep x 67" High for 750kVA

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Thoroughly examine site conditions for acceptance of transformer installation to verify conformance with manufacturer and specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 PREPARATION

- A. Insure all conduit stub-ups for bottom entry into transformer are in place and located as required per shop drawings.
- B. Where noted on the drawings provide a 4" high concrete housekeeping pad beneath equipment. Coordinate actual sizes of equipment base with shop drawings and extend pad 3" in all directions beyond overall dimension of base. Provide reinforcing bars as required structurally within pad to insure proper support of equipment.

3.3 INSTALLATION

- A. Install transformer in accordance with manufacturer's written instructions, as shown on the drawings and as specified herein.
- B. Transformers shall be installed to provide adequate air circulation for the removal of the heat they produce, in accordance with manufacturer recommendations.
- C. Transformers not specifically designed for wall mounting, shall be spaced a minimum of 6" from adjacent walls, and equipment.
- D. Transformers shall be anchored and braced to withstand seismic forces.
- E. Loosen and/or remove all shipping bolts in accordance with manufacturer's instructions.
- F. All transformers shall comply with mounting requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- G. All conduits shall be isolated from the transformer enclosures by the use of neoprene grommets at conduit entrances to enclosure and the use of a grounding bushing. Flexible jumpers shall be installed for grounding continuity from enclosure to conduits or bus ducts.

3.4 TERMINATIONS

- A. Provide all transformers with lugs for both primary and secondary conductor sizes for conductors shown on Drawing. Connect lug to termination point with appropriate size bolt, nut flat and Belleville washers.

- B. Provide high-pressure compression lugs, for primary and secondary phase and neutral terminations for transformers 45 KVA and larger. Utilize only the tool and dies designed for uses in installing the lugs provided.
- C. Use flexible conduit indoors in dry locations or liquidtight flexible conduit in damp/wet locations, 24" minimum in length, for primary and secondary connections to transformer case. Make connections to side panels of enclosure, except for floor mounted transformers fed from directly below enclosure.
- D. Where feeders come from the floor below, they shall terminate at the end of transformer enclosure with a metal grounding bushing with neoprene throat insert. Ground the bushing to the transformer enclosure.

3.5 GROUNDING

- A. Provide transformer with a dual rated four-barrel solderless grounding lug with a 5/8" -11 threaded hole. Drill transformer enclosure with 11/16" bit and attach lug to enclosure utilizing a torque bolt and Dragon Tooth transition washer. Connect the following:
 - 1. Primary feeder ground.
 - 2. Secondary feeder ground.
 - 3. Grounding electrode.
 - 4. Main bond jumper to neutral (when present).

3.6 IDENTIFICATION

- A. Provide transformer nameplate as described in Section 260553.

3.7 ADJUSTING

- A. The Contractor shall set the taps on all transformers, which are a part of this contract as necessary to provide satisfactory operating voltages with all present loads energized, including the new loads and any existing loads. A check shall be made in the presence of the City of New York's Representative at a panel fed from each transformer that is the farthest from the transformer.
- B. The Contractor shall provide all instruments and accessories required to perform the checks. Voltmeters shall be accurate with 3/4 or 1% and shall have scales permitting the voltage readings to be made on the upper half of the scale. Calibration of the meters shall be satisfactory to the City of New York.
- C. Infrared Scanning: Two months after Substantial Completion, perform an infrared scan of transformer connections.
 - 1. Use an infrared-scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration.
 - 2. Perform 2 follow-up infrared scans of transformers, one at 4 months and the other at 11 months after Substantial Completion.
 - 3. Prepare a certified report identifying transformer checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and scanning observations after remedial action.

3.8 CLEANING

- A. Prior to energizing of transformer the contractor shall thoroughly clean the interior of enclosure of all construction debris, scrap wire, etc. using manufacturer's approved methods and materials.
- B. Upon completion of project prior to final acceptance the contractor shall thoroughly clean both the interior and exterior of transformer per manufacturers recommended materials and methods. Remove paint splatters and other spots, dirt, and debris.
- C. Touch-up paint any marks, blemishes, or other finish damage suffered during installation.

END OF SECTION 262200

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SECTION 262413 - SWITCHBOARDS

PART 1 - SUMMARY

1.1 GENERAL

- A. This section includes labor, materials and equipment necessary to complete the installation required for the item specified under this Division, including but not limited to:

Dead-front, Low-voltage (600 V or less) Distribution Switchboards

- B. Related Work: Consult all other Sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete installation.

- C. Section Includes:

- a. Service and distribution switchboards rated 600 V and less.
- b. Power Quality Meter.
- c. Transient voltage suppression devices.
- d. Disconnecting and overcurrent protective devices.
- e. Instrumentation.
- f. Control power.
- g. Accessory components and features.
- h. Identification.
- i. Mimic bus.

1.2 REFERENCES

- A. Comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

UL 486A Wire Connectors and Soldering Lugs for use with Copper Conductors

UL 489 Molded- Case Circuit Breakers and Circuit Breaker Enclosures

UL 891 Dead-Front Electrical Switchboards

ANSI C12 Code for Electricity Metering

ANSI C39.1 Requirements for Electrical Analog Indicating Instruments

ANSI C57.13 Requirements for Instrument Transformers

FS W-C-375 Circuit Breakers Molded Case, Branch Circuit and Service

NEMA AB 1 Molded Case Circuit Breakers

NEMA PB 2 Dead Front Distribution Switchboards

NEMA PB 2.1 Instructions for Safe Handling, Installation, Operation and Maintenance of Deadfront Switchboards Rated 600 Volts or less

1.3 SUBMITTALS

- A. Product Data: For each type of switchboard, overcurrent protective device, transient voltage suppression device, ground-fault protector, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
- B. Shop Drawings: For each switchboard and related equipment.
- a. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
 - b. Shop drawings shall include:
 - 1) Front, plan and side view elevations with overall dimensions.
 - 2) Conduit entrance locations and requirements
 - 3) Nameplate legends; size and number of bus bars per phase, neutral, and ground
 - 4) Switchboard instrument details and accessories
 - 5) Single line & schematic diagrams.
 - c. Detail enclosure types for types other than NEMA 250, Type 1.
 - d. Detail bus configuration, current, and voltage ratings.
 - e. Detail short-circuit current rating of switchboards and overcurrent protective devices.
 - f. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - g. Include time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.
 - h. Include diagram and details of proposed mimic bus.
 - i. Include schematic and wiring diagrams for power, signal, and control wiring.
 - j. Submit manufacturer's installation instructions.
 - k. Complete Bill of Material listing all components.
 - l. Submit Field Test reports.
- C. Dimensions and configurations of switchboards shall conform to the space allocated on the Drawings. The contractor shall submit a revised layout if equipment furnished varies in size from that shown on drawings for the City of New York's Representative approval.
- D. Samples: Representative portion of mimic bus with specified material and finish, for color selection.
- E. Submit seismic anchorage calculations prepared by a professional engineer
- F. Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals include the following:
- a. Routine maintenance requirements for switchboards and all installed components.
 - b. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 - c. Time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.
- B. Testing Agency Qualifications: Member Company of NETA or an NRTL.
Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- C. Source Limitations: Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- D. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery: Switchboard components shall not be delivered to the site until protected storage space is available. Storage outdoors covered by rainproof material is not acceptable. Equipment damaged during shipment shall be replaced and returned to manufacturer at no additional cost to the City of New York's Representative. Components shall be properly packaged in factory-fabricated containers and mounted on shipping skids.
- B. Storage: Store in a clean, dry, ventilated space free from temperature extremes. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect units from dirt, water, construction debris, and traffic. Provide heat where required to prevent condensation.
- C. Handling: Handle in accordance with NEMA PB2.1 and manufacturer's written instructions. Be careful to prevent internal component damage, breakage, denting and scoring. Damaged units shall not be installed. Replace damaged units and return equipment to manufacturer.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations:
- B. Do not deliver or install switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by City of New York or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
- D. Notify Construction Manager no fewer than 7 days in advance of proposed interruption of electric service.
- E. Do not proceed with interruption of electric service without Construction Manager written permission.

- F. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchgear, including clearances between switchgear, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.7 COORDINATION

- A. Coordinate layout and installation of switchboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.8 WARRANTY

- A. Equipment and components offered under this Section shall be covered by a one (1) year parts and labor warranty for malfunctions resulting from defects in materials and workmanship.

1.9 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- B. Control-Power Fuses: Equal to 20 percent of quantity installed for each size and type, but no fewer than two of each size and type.
- C. Indicating Lights: Equal to 20 percent of quantity installed for each size and type, but no fewer than one of each size and type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cutler Hammer
 - 2. Square D
 - 3. General Electric

2.2 RATINGS

- A. The assembly shall be rated to withstand mechanical forces exerted during short-circuit conditions when connected directly to a power source having available fault current 200,000 amperes symmetrical at rated voltage unless noted otherwise on the drawings.
- B. Voltage ratings shall be as indicated on the drawings.
- C. Front-Connected, Front-Accessible Switchboards:

1. Main Devices: Fixed, individually mounted.
 2. Branch Devices: Panel mounted.
 3. Sections front and rear aligned.
- D. Switchboards shall be rated for indoor installation NEMA 1.
- E. Switchboards shall be fully self-supporting structures with 90 inch tall vertical sections (excluding lifting eyes and pull boxes) bolted together to form required arrangement.
- F. Switchboard frame shall be die formed, 12 gauge steel with reinforced corner gussets. Frame shall be rigidly bolted to support cover plates code gauge steel, bus bars and installed devices during shipment and installation.
- G. All sections may be rolled, moved or lifted into position. Switchboards shall be capable of being bolted directly to the floor without the use of floor sills.
- H. All switchboard sections shall have open bottoms and removable top plate(s) to install conduit.
- I. Front-Access only switchboard sections shall be front and rear aligned for placement against a wall.
- J. Switchboards shall be UL listed.
- K. All covers shall be fastened by hex head bolts.
- L. Provide hinged doors over metering compartments and individually mounted device compartments. All doors shall have concealed hinges and be fastened by hex head bolts.
- M. Switchboard protective devices shall be furnished as listed on drawings and specified herein, including interconnections, instrumentation and control wiring.
- N. Switchboard current ratings, including all devices, shall be based on a maximum ambient temperature of 25 degree C per UL Standard 891. With no derating required, temperature rise of switchboards and devices shall not exceed 65 degrees C in a 25 degree C ambient environment.
- O. Mounting for the group mounted devices shall be by bolted connections. No plug-in type connections shall be used for current carrying components.
- P. Incoming Section
- Q. Incoming section shall be bussed pull section.
- R. Furnish switchboard(s) arranged for bottom or top entry based on the incoming cables.
- S. Provide mechanical lugs in the quantity and size required per the contract drawings.
- T. All lugs shall be tin-plated and UL listed for use with copper cable. Lugs shall be rated for 75 degree C. Cable.
- U. Bus Bars

- V. Bus bars shall be silver-plated copper. The bus bars shall have sufficient cross sectional area to meet UL 891 temperature rise requirements. Phase and neutral bus ampacity shall be as shown on the plans.
- W. The neutral bus shall have the same ampacity as the phase bus.
- X. Bus bars shall be mounted on high impact, non-tracking insulated supports. Joints in the vertical bus are not permitted.
- Y. Bus bars shall be braced to withstand mechanical forces exerted during short circuit conditions as indicated in drawings, but in no case less than 65KA RMS SYM.
- Z. Bus joints shall be bolted with high tensile steel Grade 5 bolts. Belleville type washers shall be provided with aluminum bus. Welded connections are unacceptable.
- AA. Ground Bus shall be sized to meet UL 891. Ground bus shall extend full length of switchboard. Ground bus shall be copper
- BB. A-B-C bus arrangement (left to right, top to bottom, front to rear) shall be used throughout to assure convenient and safe testing and maintenance. Where special circuitry precludes this arrangement, bus bars shall be labeled.
- CC. All feeder device line and load connection straps shall be rated to carry current rating of device frame not trip rating.
- DD. The main incoming bus bars shall be rated for the main protection device frame size or main incoming conductors, if there is no main device.
- EE. Main horizontal bus bars shall be fully rated and arranged for future extensions.

2.3 OVERCURRENT PROTECTIVE DEVICES

- A. Main Devices
 - 1. Main device shall be individually mounted, manually operated, stationary mounted. Insulated case switch.
 - 2. All circuit protective devices shall have the following minimum symmetrical current interrupting capacity 100kA or as listed on the contract drawings.
- B. Feeder Devices

Feeder devices shall be group mount molded case circuit breakers or fused switches.
- C. Insulated-Case Circuit Breaker (ICCB): Cutler-Hammer type Magnum SBSE or approved equal, fuse-less current limiting type with fast opening, 100 percent rated, sealed, insulated-case power circuit breaker with 200,000-ampere rms symmetrical interrupting capacity rating to meet available fault current.
- D. Fixed circuit-breaker mounting.
- E. Two-step, stored-energy closing.
- F. Each circuit breaker shall be equipped with a solid-state tripping system consisting of three (3) current sensors, microprocessor-based trip device and flux-transfer shunt trip. Current sensors

shall provide operation and signal function. The trip unit shall use microprocessor-based technology to provide the basic adjustable time/current protection functions. True rms sensing circuit protection shall be achieved by analyzing the secondary current signals received from the circuit breaker current sensors, and initiating trip signals to the circuit breaker trip actuators when predetermined trip levels and time-delay settings are reached. The trip unit shall be Cutler-Hammer type Digtrip 510 or approved equal.

- G. Full-function, microprocessor-based trip units with interchangeable rating plug, trip indicators, and the following field-adjustable settings:
 - a. Long-Time pickup & delay
 - b. Short-time pickup & delay
 - c. Instantaneous trip, (main disable, feeder enable)
- H. Breakers shall be constructed of a high dielectric strength, glass reinforced insulating case. The interrupting mechanism shall be arc chutes. Steel vent grids shall be used to suppress arcs and cool vented gases. Inter-phase barriers shall to isolate completely each pole.
- I. Breakers shall contain a true two-step stored energy operating mechanism which shall provide quick make, quick break operation with a maximum five cycle closing time. Breakers shall be trip free at all times. Common tripping of all poles shall be standard.
- J. A charging handle, close push-button, open push-button, and Off/On/Charge indicator shall be located on the breaker escutcheon and shall be visible with the breaker compartment door closed.
- K. To ensure a selective system, all circuit breakers shall have 30-cycle short-time withstand ratings equal to 18 times their frame ratings. Insulated case circuit breakers without an instantaneous trip element adjustment shall be equipped with a fixed internal instantaneous override set at that level.
- L. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
- M. Thermal magnetic molded case circuit breakers shall be provided with adjustable magnetic trip for frame size 250 amps and below.
- N. Each feeder with a frame size 400 amps and larger shall have digital electronic trip units.
- O. Breakers shall be standard 80 percent rated.
- P. Group mounted breakers shall be connected to the vertical bus by bolted connections.
- Q. Individually mounted molded case circuit breakers shall be stationary mounted.
- R. Circuit breaker frames shall be constructed of a high-strength, molded, glass-reinforced polyester case and cover. Breakers shall have an overcenter, toggle handle-operated, trip free mechanism with quick make, quick break action independent of the speed of the toggle handle operation. The design shall provide common tripping of all poles. Breakers shall be suitable for reverse feeding.
- S. Breakers shall have ON and OFF position clearly marked on escutcheon. Breakers shall include a trip-to-test means on the escutcheon for manually tripping the breaker and exercising the mechanism and trip latch.

- T. Breakers shall include factory installed mechanical lugs. Lugs shall be UL listed and rated 75 degrees C.
- U. Digital Electronic Trip Unit for Circuit Breakers
- a. Each molded case circuit breaker microprocessor-based tripping system shall consist of three (3) current sensors, a trip unit and a flux-transfer shunt trip. The trip unit shall use microprocessor-based technology to provide the adjustable time-current protection functions. True rms sensing circuit protection shall be achieved by analyzing the secondary current signals received from the circuit breaker current sensors, and initiating trip signals to the circuit breaker trip actuators when predetermined trip levels and time-delay settings are reached. The trip unit shall be Cutler-Hammer type Digitrip 310, Digitrip 310+ or approved equal.
 - b. The protective trip unit shall consist of a solid state, microprocessor based programmer; tripping means; current sensors; power supply and other devices as required for proper operation.
 - c. As a minimum, the trip unit shall have the following protective functions:
 - 1) Adjustable long time pickup;
 - 2) Adjustable long time delay;
 - 3) Adjustable short time pickup;
 - 4) Adjustable short time delay;
 - 5) Adjustable instantaneous pickup;
 - d. As a minimum, the trip unit shall include the following features:
 - 1) Long time and short time protective functions shall have true RMS sensing technology.
 - 2) High contrast liquid crystal display (LCD) unit shall display settings, trip targets, and the specified metering displays.
 - 3) Multi-button keypad to provide local setup and readout of all trip settings on the LCD.
 - 4) UL Listed interchangeable rating plug. It shall not be necessary to remove the trip unit to change the rating plug.
 - 5) An integral test jack for testing via a portable test set and connection to a battery source.
 - 6) A mechanism for sealing the rating plug and the trip unit.
 - 7) Noise immunity shall meet the requirements of IEEE C37.90.
 - 8) Display trip targets for long time, short time, and ground fault, if included.
 - e. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

2.4 QUICK-MAKE/QUICK-BREAK FUSIBLE SWITCHES

- A. Protective devices shall be quick-make/quick-break fusible switches as manufactured by Eaton Corporation type FDP. Fusible switches 30 amperes through 600 amperes frames shall be furnished with rejection Class "R" or "J" type fuse clips unless otherwise scheduled. Fusible switches 800 amperes through 1200 amperes shall be furnished with Class L fuse clips. Switches shall incorporate safety cover interlocks to prevent opening the cover with the switch in the ON position or prevent placing the switch in the ON position with the cover open. Provide defaeter for authorized personnel. Handles shall have provisions for padlocking and shall clearly indicate the ON or OFF position. Front cover doors shall be pad-lockable in the closed position.

2.5 ELECTRONIC POWER METERS

A. Power Quality Meter

1. Where indicated on the drawings, provide a line Meter Monitor and Protection (MM&P) device, Cutler-Hammer type IQ DP-4000 Series or pre-approved equal having the same

features and functions. The MM&P shall provide the metering functions with % of full scale accuracy as indicated, and auto range between units, kilounits and megaunits. The MM&P shall provide the adjustable protection functions indicated and the capability to communicate data via twisted pair network. The MM & P shall be UL listed, cUL and CE certified and also meet ANSI standard C37.90.1 for surge withstand.

Metered Values

AC Phase Amperes +/- (0.3%)
 AC Phase Voltage +/- (0.3%)
 Watts +/- (0.6%)
 VA +/- (0.6%)
 vars +/- (0.6%)
 Power Factor 1.0% (+/- 1 digit)
 Frequency +/- (0.1 Hz)
 Watthours +/- (0.6%)
 varhours +/- (0.6%)
 VA hours +/- (0.6%)
 Watt Demand with
 10-, 15-, 20-, 25-, 30-,
 45-, 60-minute interval)
 %THD (through 31st harmonic)
 Minimum/Maximum for Voltage, Current ,
 Power, Power Factor and Frequency.
 Peak % THD & Peak Demand
 hour

Alarm/Other Functions

Voltage Phase Loss
 (less than 50% rms)
 Current Phase Loss
 (1/16 largest phase)
 Phase Voltage Unbalance
 (5 to 40% – 5% steps)
 Phase Voltage Reversal
 Overvoltage
 (105 to 140% – 5% steps)
 Undervoltage (95 to 60% – 5% steps)
 Time Delay for Overvoltage,
 Undervoltage, and Phase
 Unbalance
 (0-20 seconds, 1-sec. steps)
 Synchronizing pulse input
 Load Shed feature
 Form C output for trip, alarm kilowatt-
 pulse contacts

- B. The MM&P shall be supplied with three (3) current transformers sized as required. Potential transformers shall be self-included and fused for up to 600 volts with potential connections suitable for 3-phase 100V, 208/220/240V, 380/416V, 460/575V. Above 600V, provide fused external potential transformers.
- C. The MM&P control power shall be capable of being supplied from the monitored incoming AC line or supplied from a separate control power source when indicated on the drawings (96 to 264 Vac or 100 to 350 Vdc).
- D. Make provisions for an addressable communication card capable of transmitting all data, including trip data over a compatible two-wire local area network to a central personal computer for storage and/or printout. The network shall also be capable of transmitting data in RS-232c format via a translator module.

2.6 ELECTRIC POWER METER

- A. Where indicated on the drawings, provide a Meter Monitor (MM) device Cutler-Hammer IQ 300 Series or pre-approved equal having the features and functions specified below. The MM shall meet the accuracy portion of ANSI C12.16 Class 10 for revenue metering. The MM shall monitor and display the functions listed below with the accuracy indicated. The MM shall be UL listed, cUL, CSA and CE certified and also meet ANSI standard C37.90.1 for surge withstand.
- B. The MM shall monitor and display the functions listed below with the accuracy indicated. The MM shall be UL listed, cUL, CSA and CE certified and also meet ANSI standard C37.90.1 for surge withstand.
- C. The MM display shall be NEMA 1, 12, or 3R rated and connected to a separate meter base separate via a standard Category 5 cable. The base shall be capable of being remote panel or DIN-rail mountable or mounting directly to the display. The MM display shall have a 8 digit

numeric and 10 alphanumeric character, plus dedicated icons, reverse mode LCD with LED backlight display.

D. All monitored parameters shall be viewable at the display with four button user interface or via network communications. All set points and recorded minimum and maximums shall be stored in non-volatile memory.

E. Metered Values shall be as follows with accuracy in percent of full scale as indicated:

- | | | |
|----|---|------------|
| 1. | AC Phase Voltage and Amperes | +/- 0.5% |
| 2. | Watts, VA, Vars | +/- 1.0% |
| 3. | Power Factor | +/- 2.0% |
| 4. | Frequency | +/- 0.1 Hz |
| 5. | Watthours, VA, Varhours | +/- 1.0% |
| 6. | Watt Demand with 10-, 15-, 20-, 25-, 30-, 45-, 60-minute interval | |
| 7. | Minimum/Maximum Voltage, Current, Power, Power Factor, Frequency | |
| 8. | Peak Demand. | |

F. The MM shall be supplied with three (3) current transformers sized as required. Potential transformers shall be self-included and fused for up to 600 volts with potential connections suitable for 3-phase 100V, 208/220/240V, 380/416V, 460/575V. Above 600V, provide fused external potential transformers.

G. The MM control power shall be capable of being supplied from the monitored incoming AC line or supplied from a separate control power source when indicated on the drawings (90 to 600 Vac or 48 to 250 Vdc).

H. A solid-state relay KYZ pulse output shall be provided for use with a watt-hour pulse recorder or totalizer.

I. Provide communication capability of transmitting data over a compatible two-wire local area network (LAN) to central personal computer for storage and /or printout. The network shall also be capable of transmitting data in RS-232c format via a translator module.

2.7 TRANSIENT VOLTAGE SUPPRESSION DEVICES

A. Surge Protection Device Description, refer to Section 264313.

B. Factory-installed, integral TVSS; labeled by an NRTL for compliance with UL 67 after installing TVSS.

2.8 WIRING/TERMINATIONS

A. Small wiring, necessary fuse blocks and terminal blocks within the switchboard shall be furnished as required. Control components mounted within the assembly, such as fuse blocks, relays, pushbuttons, switches, etc., shall be suitably marked for identification corresponding to appropriate designations on manufacturer's wiring diagrams.

B. Mechanical-type terminals shall be provided for all line and load terminations suitable for copper or aluminum cable rated for 75°C of the size as indicated on the drawings.

C. Lugs shall be provided in the incoming line section for connection of the main grounding conductor. Additional lugs for connection of other grounding conductors shall be provided as indicated on the drawings.

- D. All wiring gutters shall extend the full length and depth of the switchboard.
- E. All control wire shall be type SIS, bundled and secured with nylon ties. Insulated locking spade terminals shall be provided for all control connections, except where saddle type terminals are provided integral to a device. All current transformers secondary leads shall first be connected to conveniently accessible short-circuit terminal blocks before connecting to any other device. All groups of control wires leaving the switchboard shall be provided with terminal blocks with suitable numbering strips. Provide wire markers at each end of all control wiring.

2.9 MISCELLANEOUS

- A. The switchboard shall be provided with cable pull section at the top or bottom of the switchboard, depending upon the location of the incoming and outgoing feeders. Provide a minimum 12" of vertical clearance between the cable terminal lugs bolted to the switchboard buses and the top and bottom of the switchboard enclosure. Horizontal pull sections and gutters shall be kept free and clear of buses. Where busses cross vertical pull sections, the busses shall be insulated.
- B. Load connections shall be provided with two-hole compression lugs, sized in accordance with the riser diagram, for the cable sizes indicated and shall be so located within the enclosure that not live parts are accessible from wiring gutters. All devices shown on drawings as specified herein, and necessary fuse blocks, terminal blocks and interconnecting wiring shall be factory installed. All groups of control wires leaving the switchboard shall be provided with terminal blocks with numbering strips. Clamp type terminals for all incoming and out-going cables shall have a UL stamp for copper conductors.
- C. Connections to current transformers, breakers or other devices or equipment in the panel and connected to the bus shall not be used for bus supports.

D. Finish

All metal structural and unit parts shall be completely painted so that interior and exterior surfaces have a complete finish coat on and between them.

Enclosure shall be thoroughly cleaned, rinsed, pretreated with phosphatizing process followed by sealer rinses and rust inhibitor process and painting.

Paint shall be UL recognized acrylic, baked enamel ANSI-61 light gray.

- E. Provide minimum of 35% additional space, for future applications.
- F. Construction and installation shall meet seismic Zone requirements.
- G. Mimic Bus: Continuously integrated mimic bus factory applied to front of switchboard. Arrange in single-line diagram format, using symbols and letter designations consistent with final mimic-bus diagram.

Coordinate mimic-bus segments with devices in switchboard sections to which they are applied. Produce a concise visual presentation of principal switchboard components and connections.
- H. Vibration Isolation: All switchboards shall be mounted on Restrained Neoprene Mounts, as defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine switchboards before installation. Reject switchboards that are moisture damaged or physically damaged. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Thoroughly examine site conditions for acceptance of switchboard installation to verify conformance with manufacturer and specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 INSTALLATION

- A. Install switchboards in accordance with manufacturer's written instructions, as shown on the drawings and as specified herein.
- B. Handling, storage, installation and energize of switchboards shall be carried out in accordance with latest edition of NEMA Publications PB 2.1.
- C. Freestanding switchboards shall be accurately aligned, leveled and bolted in place on full-length channels securely fastened to concrete floor.
- D. Provide mounting hardware brackets, bus bar drilling and filler pieces for all unused spaces.
- E. Replace any panel pieces, doors or trims having dents, bends, warps or poor fit that may impede ready access, security or integrity.
- F. Conduits terminating in concentric, eccentric or oversized knockouts at switchboards shall have ground bushings and bonding jumpers installed interconnecting all such conduits and the switchboards.
- G. Check and tighten all bolts and connections with a torque wrench using manufacturer's recommended values.
- H. Conduits entering bottom of switchboard shall be terminated with a metal grounding bushing with neoprene throat insert. Each bushing shall be connected to the switchboard ground bus with a #4 insulated ground conductor.
- I. Contractor shall be responsible for ensuring that termination of conduits entering the top of switchboards constitutes a tight and continuous metal-to-metal contact by penetrating the finish paint on the inside of the enclosure.
- J. Provide permanent identification for each feeder and piece of equipment by means of plastic laminated nameplates. All nameplates shall conform to requirements of Section 260553.
- K. Install phase identification tape on all feeders within switchboards.
- L. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- C. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Independent Testing: Arrange and pay for the services of an independent testing agency to perform all quality control electrical testing, calibration and inspection required herein. Testing agencies objectives shall be to:
 - 1. Assure switchboard installation conforms to specified requirements and operates within specified tolerances.
 - 2. Field test and inspect to insure operation in accordance with manufacturer's recommendations and specifications.
 - 3. Prepare final test report including results, observations, failures, adjustments and remedies.
 - 4. Apply label on switchboard upon satisfactory completion of tests and results.
 - 5. Verify ratings and settings and make final adjustments.
- B. City of New York Witnessed Testing: Allow a period of 2 hours per switchboard for the City of New York's Representative to review and final check. This review shall be done when the switchboard is de-energized, therefore plan accordingly.
- C. Supply a suitable and stable source of electrical power to each test site. The testing agency shall specify the specific power requirements.
- D. Testing of overcurrent protective devices shall be done only after all devices are installed and system is energized.
- E. Prefunctional Testing
 - 1. Provide testing agency with contract documents and manufacturer instructions for installation and testing.
 - 2. Visual and mechanical inspection:
 - a. Inspect for physical damage, defects alignment and fit.
 - b. Perform mechanical operational tests in accordance with manufacturer's instructions.
 - c. Compare nameplate information and connections to contract documents.
 - d. Check tightness of all control and power connections.
 - e. Check that all covers, barriers, and doors are secure.
 - f. Verify that relays and overcurrent protective devices meet specified requirements.
- F. Electrical Tests

- G. Insulation Resistance: 1000 volt DC tests for one minute on all 600 volt and lower rated equipment, components, buses, feeder and branch circuits, and control circuits. Test phase-to-phase and phase-to-ground circuits showing less than 10 megohms resistance to ground shall be repaired or replaced.
 - H. Circuit Continuity: All feeders shall be tested for continuity. All neutrals shall be tested for improper grounds.
 - I. Ground Resistance: Test resistance to ground of system and equipment ground connection.
 - J. In the event that the system fails to function properly during the testing, as a result of inadequate pretesting or preparation, the contractor shall bear all costs incurred by the necessity for retesting including test equipment, transportation, subsistence and the City of New York's Representative's hourly rate.
 - K. Replace at no additional cost to the City of New York all devices that are found defective or do not operate within factory specified tolerances.
 - L. Submit the testing agency's final report for review prior to project closeout and final acceptance by the City of New York. Test report shall indicate test dates, devices tested, results, observation, deficiencies and remedies. Test report shall be included in the operation and maintenance manuals.
- 3.5 ADJUSTING
- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- 3.6 PROTECTION
- A. Temporary Heating: Apply temporary heat, to maintain temperature according to manufacturer's written instructions, until switchboard is ready to be energized and placed into service.
- 3.7 DEMONSTRATION
- A. Engage a factory-authorized service representative to train City of New York's maintenance personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories.

END OF SECTION 262413

SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Single and duplex receptacles, ground-fault circuit interrupters.
 - 2. Single- and double-pole snap switches.
 - 3. Device wall plates.
 - 4. Pin and sleeve connectors and receptacles.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. PVC: Polyvinyl chloride.
- D. RFI: Radio-frequency interference.
- E. TVSS: Transient voltage surge suppressor.
- F. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.
- D. Field quality-control test reports.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device through one source from a single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

- C. Comply with NFPA 70.

1.6 COORDINATION

- A. Receptacles for The City of New York-Furnished Equipment: Match plug configurations.
 - 1. Cord and Plug Sets: Match equipment requirements.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Wiring Devices:
 - a. Bryant Electric, Inc./Hubbell Subsidiary.
 - b. Eagle Electric Manufacturing Co., Inc.
 - c. Hubbell Incorporated; Wiring Device-Kellems.
 - 2. Wiring Devices for Hazardous (Classified) Locations:
 - a. Crouse-Hinds/Cooper Industries, Inc.; Arrow Hart Wiring Devices.
 - b. EGS/Appleton Electric Company.
 - c. Killark Electric Manufacturing Co./Hubbell Incorporated.

2.2 RECEPTACLES

- A. Straight-Blade-Type Receptacles: Comply with NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL 498.
- B. Straight-Blade and Locking Receptacles: Hospital grade.
- C. Straight-Blade Receptacles: Hospital grade.
- D. GFCI Receptacles: Straight blade, feed through type, Hospital grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch- deep outlet box without an adapter.

E. Isolated-Ground Receptacles: Straight blade, Hospital grade, orange, duplex receptacle, with equipment grounding contacts connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap.

1. Devices: Listed and labeled as isolated-ground receptacles.
2. Isolation Method: Integral to receptacle construction and not dependent on removable parts.

F. Industrial Heavy-Duty Pin and Sleeve Devices: Comply with IEC 309-1.

G. Hazardous (Classified) Location Receptacles: Comply with NEMA FB 11.

H. Provide "while in use" covers for weatherproof receptacles.

I. Outdoor Receptacles: to be weatherproof type with integral GFI function and "While in Use" cover.

2.3 SWITCHES

A. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.

B. Snap Switches: Heavy grade, quiet type.

C. Combination Switch and Receptacle: Both devices in a single gang unit with plaster ears and removable tab connector that permit separate or common feed connection.

1. Switch: 20 A, 120/277-V ac.
2. Receptacle: NEMA WD 6, Configuration 5-15R.

2.4 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.035-inch-thick, white color unless specifically noted otherwise.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Wet Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in "wet locations."

2.5 FINISHES

A. Color:

1. Wiring Devices: All walls and ceiling devices to be white color unless specifically noted otherwise.
2. Isolated-Ground Receptacles: As specified above, with orange triangle on face.
3. Floor Devices: To be gray color unless specifically noted otherwise.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install devices and assemblies level, plumb, and square with building lines.

- B. Install wall dimmers to achieve indicated rating after derating for ganging according to manufacturer's written instructions.
- C. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' written instructions.
- D. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- E. Remove wall plates and protect devices and assemblies during painting.
- F. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

- A. Comply with Division 26 Section "Common Work Results for Electrical"
 - 1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 CONNECTIONS

- A. Ground equipment according to Division 26 Section "Grounding and Bonding For Electrical Systems."
- B. Connect wiring according to Division 26 Section "Low Voltage Electrical Power Conductors and Cables."
- C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
 - 2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
- B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION 262726.

SECTION 26 28 13 - FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

- 1. Cartridge fuses rated 600 V and less for use in fused switches.

1.3 SUBMITTALS

- A. Product Data: Include the following for each fuse type indicated:

- 1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
- 2. Let-through current curves for fuses with current-limiting characteristics.
- 3. Time-current curves, coordination charts and tables, and related data.

- B. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.

- 1. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
- 2. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

- C. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals.

- 1. In addition to items specified in Division 1 include the following:

- a. Let-through current curves for fuses with current-limiting characteristics.
- b. Time-current curves, coordination charts and tables, and related data.
- c. Ambient temperature adjustment information.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain fuses from a single manufacturer.

- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

- C. Comply with NEMA FU 1.

- D. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

- A. Where ambient temperature to which fuses are directly exposed is less than 41deg F or more than 100.4 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.6 COORDINATION

- A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fuses: Quantity equal to 10 percent of each fuse type and size, but no fewer than 5 of each type and size.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper Bussman, Inc.
 - 2. Eagle Electric Mfg. Co., Inc.; Cooper Industries, Inc.
 - 3. Ferraz Shawmut, Inc.

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- B. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

- A. Service Entrance: Class L, time delay.
- B. Motor Branch Circuits: Class RK5, time delay.

3.3 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
- B. Install spare-fuse cabinet(s).

3.4 IDENTIFICATION

- A. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION 26 28 13

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SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Contract Provisions, Special Provisions, Supplementary Conditions, and Division 1 Specification Sections apply to this Section.

1.2 SUMMARY

- A. This Section includes the following individually mounted, enclosed switches and circuit breakers:
 - 1. Fusible switches.
 - 2. Nonfusible switches.
 - 3. Molded-case circuit switches.
 - 4. Enclosures.

1.3 DEFINITIONS

- A. GD: General duty.
- B. GFCI: Ground-fault circuit interrupter.
- C. HD: Heavy duty.
- D. RMS: Root mean square.
- E. SPDT: Single pole, double throw.

1.4 SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
 - 1. Enclosure types and details for types other than NEMA 250, Type 1.
 - 2. Current and voltage ratings.
 - 3. Short-circuit current rating.
 - 4. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Qualification Data: For testing agency.
- D. Field quality-control test reports including the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

- E. Manufacturer's field service report.
- F. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 include the following:
 - 1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
 - 2. Time-current curves, including selectable ranges for each type of circuit breaker.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
 - 1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.
- D. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:
 - 1. Ambient Temperature: Not less than minus 5 deg C and not exceeding 40 deg C.
 - 2. Altitude: Not exceeding 2012 meters

1.7 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Spares: For the following:
 - a. Potential Transformer Fuses: 5
 - b. Control-Power Fuses: 5
 - c. Fuses and Fusible Devices for Fused Circuit Breakers: 5
 - d. Fuses for Fusible Switches: 5
 - e. Fuses for Fused Power Circuit Devices: 5
 2. Spare Indicating Lights: Six of each type installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FUSIBLE AND NON-FUSIBLE SWITCHES

- A. Available Manufacturers:
1. Eaton Corporation; Cutler-Hammer Products
 2. General Electric Co.; Electrical Distribution & Control Division.
 3. Siemens Energy & Automation, Inc.
- B. Fusible Switch, 600A and Smaller: NEMA KS 1, Type HD, with clips or bolt pads to accommodate specified fuses, neutral bar, 3 phase, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- C. Nonfusible Switch, 600A and Smaller: NEMA KS 1, Type HD, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- D. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 2. Neutral Kit: Internally mounted; insulated, capable of being grounded, and bonded; and labeled for copper and aluminum neutral conductors.
 3. Auxiliary Contact Kit: Auxiliary set of contacts arranged to open before switch blades open.
 4. Hookstick Handle: Allows use of hookstick to operate the handle
 5. Service-Rated Switches: Labeled for use as service equipment.

2.3 MOLDED-CASE CIRCUIT BREAKERS**A. Available Manufacturers:**

1. Eaton Corporation; Cutler-Hammer Products.
2. General Electric Co.; Electrical Distribution & Control Division.
3. Siemens Energy & Automation, Inc.

B. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 225 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic Trip-Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Long- and short-time pickup levels.
 - c. Long- and short-time time adjustments.
 - d. Ground-fault pickup level, time delay, and I^2t response.
4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller and let-through ratings less than NEMA FU 1, RK-5.
5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.
6. GFCI Circuit Breakers: Single- and two-pole configurations with 5-mA trip sensitivity.

C. Molded-Case Circuit-Breaker Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical style with compression lug kits suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
4. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
5. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system specified in Division 26 Section "Electrical Power Monitoring and Control."
6. Shunt Trip: 277-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
7. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
8. Auxiliary Switch: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
9. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
10. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.

2.4 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

1. Outdoor Locations: NEMA 250, Type 3R.
2. Indoor, Dry and Clean Locations: NEMA 250 Type 1.
3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
4. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.
- B. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated. Anchor floor-mounting switches to concrete base.
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Identification for Electrical Systems."
- B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate as specified in Division 26 Section "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections and to assist in field testing. Report results in writing.
 1. Inspect mechanical and electrical connections.
 2. Verify switch and relay type and labeling verification.
 3. Verify rating of installed fuses.
 4. Inspect proper installation of type, size, quantity, and arrangement of mounting or anchorage devices complying with manufacturer's certification.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 3. Infrared Scanning:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Open or remove doors or panels so connections are accessible to portable scanner.
 - b. Follow-Up Infrared Scanning: Perform an additional follow-up infrared scan of each unit 11 months after date of Substantial Completion.
 - c. Instruments, Equipment and Reports:
 - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - 2) Prepare a certified report that identifies enclosed switches and circuit breakers included and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- 3.5 ADJUSTING
- A. Set field-adjustable switches and circuit-breaker trip ranges.
- 3.6 CLEANING
- A. On completion of installation, vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.
 - B. Inspect exposed surfaces and repair damaged finishes.

END OF SECTION 26 28 16

SECTION 26 29 13 - ENCLOSED CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes ac, enclosed controllers rated 600 V and less, of the following types:
 - 1. Across-the-line, manual and magnetic controllers.

1.3 SUBMITTALS

- A. Product Data: For each type of enclosed controller. Include dimensions and manufacturer's technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each enclosed controller.
 - 1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:
 - a. Each installed unit's type and details.
 - b. Nameplate legends.
 - c. Short-circuit current rating of integrated unit.
 - d. UL listing for series rating of overcurrent protective devices in combination controllers.
 - e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices in combination controllers.
 - 2. Wiring Diagrams: Power, signal, and control wiring.
- C. Coordination Drawings: Floor plans, drawn to scale, showing dimensioned layout, required working clearances, and required area above and around enclosed controllers where pipe and ducts are prohibited. Show enclosed controller layout and relationships between electrical components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate field measurements.
- D. Manufacturer Seismic Qualification Certification: Submit certification that enclosed controllers, accessories, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems." Include the following:
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- E. Qualification Data: For manufacturer and testing agency.
- F. Field quality-control test reports.
- G. Operation and Maintenance Data: For enclosed controllers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 include the following:
1. Routine maintenance requirements for enclosed controllers and all installed components.
 2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
- H. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed and arrange to demonstrate that dip switch settings for motor running overload protection suit actual motor to be protected.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Source Limitations: Obtain enclosed controllers of a single type through one source from a single manufacturer.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with NFPA 70.
- E. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed controllers, minimum clearances between enclosed controllers, and for adjacent surfaces and other items. Comply with indicated maximum dimensions and clearances.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store enclosed controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect enclosed controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.
- B. If stored in areas subject to weather, cover enclosed controllers to protect them from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside controllers; install electric heating of sufficient wattage to prevent condensation.

1.6 COORDINATION

- A. Coordinate layout and installation of enclosed controllers with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."
- C. Coordinate features of enclosed controllers and accessory devices with pilot devices and control circuits to which they connect.
- D. Coordinate features, accessories, and functions of each enclosed controller with ratings and characteristics of supply circuit, motor, required control sequence, and duty cycle of motor and load.
- E. Coordinate rating of controllers with motor horsepower ratings. Coordinate with the mechanical contractor's submittals prior to submitting controller submittal.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Spare Fuses: Furnish one spare for every five installed, but no fewer than one set of three of each type and rating.
 - 2. Indicating Lights: Two of each type installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Corporation; Cutler-Hammer Products.
 - 2. ABB Power Distribution, Inc.; ABB Control, Inc. Subsidiary.
 - 3. General Electrical Company; GE Industrial Systems.

2.2 ACROSS-THE-LINE ENCLOSED CONTROLLERS

- A. Manual Controller: NEMA ICS 2, general purpose, Class A, with toggle action and overload element.
- B. Magnetic Controller: NEMA ICS 2, Class A, full voltage, nonreversing, across the line, unless otherwise indicated.
 - 1. Control Circuit: 120 V; obtained from integral control power transformer with a control power source of sufficient capacity to operate connected pilot, indicating and control devices, plus 100 percent spare capacity.
 - 2. Adjustable Overload Relay: Dip switch selectable for motor running overload protection with NEMA ICS 2, Class 30 tripping characteristic, and selected to protect motor against

voltage and current unbalance and single phasing. Provide relay with Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.

- C. Combination Magnetic Controller: Factory-assembled combination controller and disconnect switch.
 - 1. Circuit-Breaker Disconnecting Means: NEMA AB 1, motor-circuit protector with field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.

2.3 ENCLOSURES

- A. Description: Flush- or surface-mounting cabinets as indicated. NEMA 250, Type 1, unless otherwise indicated to comply with environmental conditions at installed location.
 - 1. Outdoor Locations: NEMA 250, Type 3R.
 - 2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2.4 ACCESSORIES

- A. Devices shall be factory installed in controller enclosure, unless otherwise indicated.
- B. Push-Button Stations, Pilot Lights, and Selector Switches: NEMA ICS 2, heavy-duty type.
- C. Stop and Lockout Push-Button Station: Momentary-break, push-button station with a factory-applied clasp arranged so padlock can be used to lock push button in depressed position with control circuit open.
- D. Control Relays: Auxiliary and adjustable time-delay relays.
- E. Elapsed Time Meters: Heavy duty with digital readout in hours.
- F. Phase-Failure and Undervoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connection. Provide adjustable undervoltage setting.
- G. Current-Sensing, Phase-Failure Relays for Bypass Controllers: Solid-state sensing circuit with isolated output contacts for hard-wired connection; arranged to operate on phase failure, phase reversal, current unbalance of from 30 to 40 percent, or loss of supply voltage; with adjustable response delay.

2.5 FACTORY FINISHES

- A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested enclosed controllers before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and surfaces to receive enclosed controllers for compliance with requirements, installation tolerances, and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

- A. Select features of each enclosed controller to coordinate with ratings and characteristics of supply circuit and motor; required control sequence; duty cycle of motor, controller, and load; and configuration of pilot device and control circuit affecting controller functions.
- B. Select horsepower rating of controllers to suit motor controlled.

3.3 INSTALLATION

- A. See Division 26 Section "Common Work Results for Electrical" for general installation requirements.
- B. For control equipment at walls, bolt units to wall or mount on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks complying with Division 26 Section "Common Work Results for Electrical."
- C. Install freestanding equipment on concrete bases.
- D. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems"
- E. Enclosed Controller Fuses: Install fuses in each fusible switch. Comply with requirements in Division 26 Section "Fuses."

3.4 CONCRETE BASES

- A. Coordinate size and location of concrete bases. Verify structural requirements with structural engineer.
- B. Concrete base is specified in Division 26 Section "Common Work Results for Electrical," and concrete materials and installation requirements are specified in Division 3.

3.5 IDENTIFICATION

- A. Identify enclosed controller, components, and control wiring according to Division 26 Section "Identification for Electrical Systems."

3.6 CONTROL WIRING INSTALLATION

- A. Install wiring between enclosed controllers according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- B. Bundle, train, and support wiring in enclosures.
- C. Connect hand-off-automatic switch and other automatic-control devices where applicable.
 - 1. Connect selector switches to bypass only manual- and automatic-control devices that have no safety functions when switch is in hand position.
 - 2. Connect selector switches with enclosed controller circuit in both hand and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.7 CONNECTIONS

- A. Conduit installation requirements are specified in other Division 26 Sections. Drawings indicate general arrangement of conduit, fittings, and specialties.
- B. Ground equipment according to Division 26 Section "Grounding and Bonding For Electrical Systems"

3.8 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 - 1. Test insulation resistance for each enclosed controller element, bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to perform the following:
 - 1. Inspect controllers, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
 - 2. Assist in field testing of equipment including pretesting and adjusting of solid-state controllers.
 - 3. Report results in writing.
- C. Perform the following field tests and inspections and prepare test reports:
 - 1. Perform each electrical test and visual and mechanical inspection, except optional tests, stated in NETA ATS, "Motor Control - Motor Starters." Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.9 ADJUSTING

- A. Set field-adjustable switches and circuit-breaker trip ranges.

3.10 DEMONSTRATION

- A. Engage a factory-authorized service representative to train maintenance personnel to adjust, operate, and maintain enclosed controllers.

END OF SECTION 26 29 13

SECTION 262923 - VARIABLE FREQUENCY MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 GENERAL

- A. Adjustable frequency drive controllers and disconnects shall be furnished under the Electrical Contract except where specifically shown or specified to be furnished by other trades. The motor controllers and disconnects shall be manufactured and rated in accordance with NEMA, UL and IEEE standards. IEC RATED CONTACTORS AND OVERLOADS ARE NOT ACCEPTABLE.
- B. Provide adjustable frequency speed control packages for induction motors where shown on the drawings and included in the Mechanical Specifications with input power at the voltage and phase as scheduled on the drawings. The output power rating of the controller shall not be less than the full load rating of the motor, plus 10%. The Controller shall be the latest design, solid-state device, listed by UL.

1.2 SUBMITTALS

- A. Submit product data under provisions of Division 1 DDC General Conditions.
- B. Submit test results verifying nominal efficiency and power factor.
- C. Submit calculations confirming that the line harmonics and notching generated by the VFDs do not exceed the levels for a general system as defined in Institute of Electrical and Electronics Engineers Standard 519. Where Isc/IL ratio is not available, assume <50, and demonstrate that the TDD% will not exceed 8 at the PCC (Point of Common Coupling). The PCC without exception shall be considered as the load side of the Service transformer.

1.3 QUALITY ASSURANCE

- A. Pretest (burn-in) drives at full load and full speed and cycle on a dynamometer in an ambient temperature of not less than 40°C.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Adjustable frequency controllers shall be as manufactured by GE, -CAT# AF-300 P11 (Motors 1-49HP), CAT #AF-300 HC (50HP and above).
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. ABB
 - 3. Mitsubishi
- B. The AFD motor controller shall incorporate PWM technology with diode bridge front ends and IGBTs in the output section that utilize soft switching.
- C. Adjustable frequency drives for motors 50 hp and above shall be 18 pulse drives to mitigate the impact of harmonics on the building electric system.

- D. The controller shall be capable of varying its output in response to a 4-20 MA signal, as provided by the HVAC Contractor. Coordinate type of interface required with the Automatic Temperature Controls (ATC) supplier. Provide controls mounted in face of the enclosure for the following functions:
1. "Hand-Off-Auto" (H-O-A) selector switch for local or remote start/stop function.
 2. "Run" pilot light.
 3. Door mounted diagnostic indicator with touchpad interface shall incorporate:
 - a. Controller Run
 - b. Voltage to Motor
 - c. Current to Motor
 - d. Speed Indication in Hertz, Percent, RPM
 - e. KW
 - f. Elapsed Time Meter, five digit type
 - g. Over temperature
 - h. Overcurrent
 - i. Over frequency
 - j. Overvoltage
 - k. Under voltage
 - l. Motor Overload
 - m. Ground Fault
 - n. Short Circuit
 - o. Phase Loss
 - p. Control Circuit Fault
- E. "Manual/Auto" speed control selector switch and manual speed adjustment with switches and indication on face of cover. Switch shall select control of motor speed from either the ATC system or the manual speed potentiometer.
- F. VFD fault light.

2.2 CONTROLLERS

- A. The controller shall include the following inputs and output functions at a labeled terminal strip. All inputs and outputs must be completely isolated from the analog reference signal:
1. Inputs
 - a. Run Control
 - b. Stop Control
 - c. Fault Reset
 - d. Manual/Remote Speed Reference
 - e. Speed Control Signal
 - f. External Trip Contact (Three NO/NC Minimum)
 - g. Pre-Set Speed Contacts

2. Outputs

- a. Trip (Form C Contact)
 - b. One Programmable Contact
 - c. Output Frequency (0-10VDC)
 - d. Choice of Output Current, Voltage and Frequency
- B. Speed control shall be linear from 10 to 100 percent of full speed. Both the minimum and maximum speed limits shall be adjustable. The controller output frequency shall not change as a result of up to a 10 percent input voltage fluctuation. The acceleration and deceleration rates shall be fully adjustable. Provide current limit function to avoid excessive automatic acceleration and deceleration when an overcurrent condition exists. The volts-to-hertz ratio shall be adjustable. Critical frequency rejection points shall be provided and shall be programmable.
- C. The controller shall permit disconnection of power from the input or output line voltage with the controller running under load without damage to the controller components. The controller shall be able to withstand an output line short (phase-to-phase or phase-to-ground) without damage to the controller components. Controller shall shut down on short circuit and detection of any of the following conditions: a) Current 150 percent above rated current. b) Phase loss. c) Input overvoltage and under voltage in excess of 10%. d) High internal temperature. e) Ground fault and f) under frequency.
- D. The controller shall have an automatic restart function to attempt restart after the unit trips off when power is lost to the unit. A time delay shall be provided between restarts. The unit shall not attempt to restart more than five times in the automatic mode. In addition, the controller shall have a "power dip" ride-thru feature to prevent unnecessary trip-out due to momentary input power interruptions.
- E. The drive system (motor and controller) shall provide a minimum power factor of .95 at power input throughout the speed range, and a minimum efficiency (output-to-input line) of .82 at 100 percent speed and .70 at 50 percent speed.
- F. The controller shall have an adjustable carrier frequency, adjustable from 0.75 to 15 kHz without deviating maximum capacity of the controller.
- G. The controller and any associated hardware shall be 48-hour load tested at the controller manufacturer's plant prior to shipment.
- H. The controller shall not create any feedback noise on the input line that will adversely affect electronic or microprocessor based equipment (such as computers or electron microscopes), and the controller shall not impress voltage or current spikes on the system. The minimum requirements shall conform to IEEE Standard 519, Special Applications for Line Notching and Distortion. The manufacturer shall provide at no additional cost any equipment to meet this requirement; i.e., A.C. line filters of the RLC type and/or isolation transformer, or both as required to meet full compliance with IEEE 519, if controller does not meet all standards.

- I. The following additional functional features shall be provided for the controller:
1. Each controller shall be provided with a door interlocked disconnect means and semi-conductor rated fuses.
 2. Input Line Circuit Breaker - a circuit breaker shall be provided for input power. A door interlock and through-the-door operating mechanism shall be included. The breaker shall be able to be padlocked with the door open or closed; select breaker for available fault current. All breakers 200 amps and above shall be tested by the primary injection method.
 3. Manual Bypass - provide a complete bypass of the controller to allow motor to start and stop via a bypass contactor (starter) and allow service to be performed on the controller with the motor in service and without causing electrical shock hazard to servicemen. Bypass circuitry shall be supplied by the controller manufacturer as a part of the controller package. All safeties (smoke, freeze stats, motor overloads, etc.) shall remain functional in the bypass mode. By-pass shall be in a separate enclosure so controller can be removed for replacement. Controller shall be able to start into a rotating load to facilitate transfer from bypass operation.
 4. Output Overload Relay - Provide an overload relay for motor protection with manual reset pushbutton, all inside the enclosure. Provide the proper size overload elements to match motor nameplate ratings before allowing the motors to be put into service. Provide overload for each motor where multiple motors are served by one controller.
 5. Communications port that provided communications link to computer or programmable controller.
 6. Plug-in or integral diagnostic test module.
 7. Auxiliary relay with 2 N.O. and 2 N.C. contacts for remote indication of faults.
 8. MOV surge suppressors connected to incoming line terminals.
 9. Provide line and DC reactors with each controller.
 10. NEMA 1 Enclosure - the controller shall be provided with NEMA 1 Enclosure when intended for indoor use.
 11. NEMA 3R Enclosure: The controller shall be provided with a self regulating electric heater, heat sink and cooling fan, complete with required step down transformer and wiring, for controllers used outdoors.
 12. NEMA 12 Enclosure: The controller enclosure shall be UL Plenum rated or NEMA 12, if installed in an air plenum or within an air handling unit enclosure or Mechanical room.
 13. The controller shall be fully compatible to communicate through serial communication to the Building DDC equipment.
 14. Provide a 20 amp 2 pole; 250 volt rated auxiliary NC contact for wiring the space heater of the driven motor.

2.3 INTEGRAL LINE REACTORS

- A. The variable frequency drive (VFD) shall include integral 3% line reactors to reduce line noise generated by the inverter and 5% DC reactor to limit harmonics. The VFD manufacturer shall prepare and submit calculations confirming that the line harmonics and notching generated by the VFD do not exceed the levels for a general system as stated in the Institute of Electrical and Electronics Engineers Standard 519 "Guide for Harmonic Control of Static Power Converters" to a maximum of 5% Total Voltage Harmonic Distortion (VTHD), and 8% TDD for current at Point of Common Coupling (PCC). The POC shall be assumed as the Service switchboard for VTHD and TDD calculations.
- B. Line notch area shall not exceed 22,800 (V/S) and 20% notch depth.
- C. The manufacturer shall provide additional line reactors or isolation transformers to ensure that this standard is met, as necessary.
- D. Independent timed linear acceleration and deceleration functions will be provided, adjustable from 4 to 20 seconds.

2.4 FCC CLASS A RFI/EMI NOISE EMISSIONS

- A. The adjustable speed drive shall be designed to meet the guidelines regarding emissions of Radio Frequency and Electro-magnetic Interference (RFI/EMI) set by FCC Class A guidelines through the use of a tuned line filter, adjusted as required to prevent electrical distortion back into the building electrical power supply system. The unit shall comply with the FCC Class A noise emissions standard. In addition, the drive manufacturer must provide lab test results from an independent test laboratory showing this compliance.

PART 3 - EXECUTION

3.1 GENERAL

- A. Provide complete wiring diagrams to the ATC Contractor for his use in interfacing the equipment. Also submit these diagrams with the shop drawings.
- B. This Contractor is responsible for installation of controller and all wiring. Wiring shall be in strict accordance with the manufacturer's recommendations.
- C. Each controller shall be wall mounted or mounted to a Uni-strut frame as indicated on drawings. Provide 8" square by 0.375" painted steel base plate at floor below each vertical Uni-strut channel to distribute weight on floor. Floor set controller shall be set on 4" high concrete base.
- D. Refer to "Identification" Paragraph for nameplate requirements.
- E. Control wiring shall include shielded wire and be installed in conduit separate from power wiring.
- F. Each controller shall be started up under the supervision of the manufacturer's representative. In addition to start-up services, the manufacturer's representative shall provide to the client's personnel a minimum of one (1), eight-hour training classes at the job site for operation, maintenance and servicing. Training session shall be video taped in VHS format.
- G. An 'As Built' drive control schematic (ladder diagram) shall be taped to the inside of the controller cabinet.

3.2 START-UP ASSISTANCE

- A. Provide start-up assistance and manufacturer's factory trained service technician.

3.3 INDEPENDENT TEST

- A. After installation and connection to load, each variable speed drive shall be independently tested at full load by an approved agency. Submit reports for the following:
1. % VTHD at the Controller incoming terminals between phases. Provide test results for % voltage distortion upto the 31st harmonic. Provide test results for Fundamental, Harmonic and Total rms voltages.
 2. % ITHD at the Controller incoming terminals for each phase. Provide readings for % current distortion upto the 31st harmonic. Provide test results for Fundamental, Harmonic and Total rms currents. Provide K factor result.
 3. Indicate hp rating of the driven load and provide overload relay settings at the drive and the bypass controller.
- B. Harmonic Distortion at PCC.
1. The test shall demonstrate that the VFD contribution to the Total Harmonic Distortion at the PCC is less than 5% Voltage Total Harmonic Distortion (VTHD) and less than 8% Total Current Demand Distortion (TDD) at the PCC per IEEE-519 standards. The PCC shall be considered as the load side of the service transformer or incoming service switchboard or motor control center / distribution panel board feeding the drive controllers.

END OF SECTION 262923

SECTION 263353 – STATIC UNINTERRUPTIBLE POWER SUPPLY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Three-phase, on-line, double-conversion, static-type, UPS units with the following features:
 - a. Surge suppression.
 - b. Input harmonics reduction.
 - c. Inverter.
 - d. Static bypass transfer switch.
 - e. Battery and battery disconnect device.
 - f. External maintenance bypass/isolation switch.
 - g. Output isolation transformer.
 - h. Remote UPS monitoring provisions.
 - i. Battery monitoring.
 - j. Remote monitoring.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. LCD: Liquid-crystal display.
- C. LED: Light-emitting diode.
- D. PC: Personal computer.
- E. THD: Total harmonic distortion.
- F. UPS: Uninterruptible power supply.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include data on features, components, ratings, and performance.
- B. Shop Drawings: For UPS. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, components, and location and identification of each field connection. Show access, workspace, and clearance requirements; details of control panels; and battery arrangement.
 2. Wiring Diagrams: For power, signal, and control wiring.
- C. Qualification Data: For qualified testing agency.
- D. Seismic Qualification Certificates: For UPS equipment, from manufacturer.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- E. Manufacturer Certificates: For each product, from manufacturer.
- F. Factory Test Reports: Comply with specified requirements.
- G. Field quality-control reports.
- H. Performance Test Reports: Indicate test results compared with specified performance requirements, and provide justification and resolution of differences if values do not agree.
- I. Operation and Maintenance Data: For UPS units to include in emergency, operation, and maintenance manuals.
- J. Warranties: Sample of special warranties.
- K. The commissioning process requires Submittal review simultaneously with Engineering review. Bidder is alerted to the Submittal review requirements in Section 019100.

1.5 QUALITY ASSURANCE

- A. Power Quality Specialist Qualifications: A licensed Professional electrical engineer or engineering technician, currently certified by the National Institute for Certification in Engineering Technologies, NICET Level 4, minimum, experienced in performance testing UPS installations and in performing power quality surveys similar to that required in "Performance Testing" Article.
- B. Testing Agency Qualifications: Member company of NETA or an NRTL.
1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. UL Compliance: Listed and labeled under UL 1778 by an NRTL.
- E. NFPA Compliance: Mark UPS components as suitable for installation in computer rooms according to NFPA 75.

1.6 WARRANTY

- A. Special Battery Warranties: Specified form in which manufacturer and Installer agree to repair or replace UPS system storage batteries that fail in materials or workmanship within specified warranty period.

1. Warranted Cycle Life for Valve-Regulated, Lead-Calcium Batteries: Equal to or greater than that represented in manufacturer's published table, including figures corresponding to the following, based on annual average battery temperature of 77 deg F (25 deg C):

Discharge Rate	Discharge Duration	Discharge End Voltage	Cycle Life
8 hours	8 hours	1.67	6 cycles
30 minutes	30 minutes	1.67	20 cycles
15 minutes	45 seconds	1.67	120 cycles

- B. Special UPS Warranties: Specified form in which manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within special warranty period.

1. Special Warranty Period: 2 years from date of Substantial Completion.

1.7 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: 3 for every 10 of each type and rating, but no fewer than 2 of each.
2. Cabinet Ventilation Filters: 1 complete set(s).

PART 2 - PRODUCTS

2.1 OPERATIONAL REQUIREMENTS

- A. Automatic operation includes the following:
1. Normal Conditions: Load is supplied with power flowing from the normal power input terminals, through the rectifier-charger and inverter, with the battery connected in parallel with the rectifier-charger output.
 2. Abnormal Supply Conditions: If normal supply deviates from specified and adjustable voltage, voltage waveform, or frequency limits, the battery supplies energy to maintain constant, regulated inverter power output to the load without switching or disturbance.
 3. If normal power fails, energy supplied by the battery through the inverter continues supply-regulated power to the load without switching or disturbance.
 4. When power is restored at the normal supply terminals of the system, controls automatically synchronize the inverter with the external source before transferring the load. The rectifier-charger then supplies power to the load through the inverter and simultaneously recharges the battery.
 5. If the battery becomes discharged and normal supply is available, the rectifier-charger charges the battery. On reaching full charge, the rectifier-charger automatically shifts to float-charge mode.

6. If any element of the UPS system fails and power is available at the normal supply terminals of the system, the static bypass transfer switch switches the load to the normal ac supply circuit without disturbance or interruption.
7. If a fault occurs in the system supplied by the UPS, and current flows in excess of the overload rating of the UPS system, the static bypass transfer switch operates to bypass the fault current to the normal ac supply circuit for fault clearing.
8. When the fault has cleared, the static bypass transfer switch returns the load to the UPS system.
9. If the battery is disconnected, the UPS continues to supply power to the load with no degradation of its regulation of voltage and frequency of the output bus.

B. Manual operation includes the following:

1. Turning the inverter off causes the static bypass transfer switch to transfer the load directly to the normal ac supply circuit without disturbance or interruption.
2. Turning the inverter on causes the static bypass transfer switch to transfer the load to the inverter.

C. Maintenance Bypass/Isolation Switch Operation: Switch is interlocked so it cannot be operated unless the static bypass transfer switch is in the bypass mode. Device provides manual selection among the three conditions in subparagraphs below without interrupting supply to the load during switching:

1. Full Isolation: Load is supplied, bypassing the UPS. Normal UPS ac input circuit, static bypass transfer switch, and UPS load terminals are completely disconnected from external circuits.
2. Maintenance Bypass: Load is supplied, bypassing the UPS. UPS ac supply terminals are energized to permit operational checking, but system load terminals are isolated from the load.
3. Normal: Normal UPS ac supply terminals are energized and the load is supplied through either the static bypass transfer switch and the UPS rectifier-charger and inverter, or the battery and the inverter.

D. Environmental Conditions: The UPS shall be capable of operating continuously in the following environmental conditions without mechanical or electrical damage or degradation of operating capability, except battery performance.

1. Ambient Temperature for Electronic Components: 32 to 104 deg F
2. Relative Humidity: 0 to 95 percent, noncondensing.
3. Altitude: Sea level to 500 feet.

2.2 PERFORMANCE REQUIREMENTS

A. The UPS shall perform as specified in this article while supplying rated full-load current, composed of any combination of linear and nonlinear load, up to 100 percent nonlinear load with a load crest factor of 3.0, under the following conditions or combinations of the following conditions:

1. Inverter is switched to battery source.
2. Steady-state ac input voltage deviates up to plus or minus 10 percent from nominal voltage.
3. Steady-state input frequency deviates up to plus or minus 5 percent from nominal frequency.

4. THD of input voltage is 15 percent or more with a minimum crest factor of 3.0, and the largest single harmonic component is a minimum of 5 percent of the fundamental value.
 5. Load is 50 percent unbalanced continuously.
- B. Minimum Duration of Supply: If battery is sole energy source supplying rated full UPS load current at 80 percent power factor, duration of supply is 10 minutes.
 - C. Input Voltage Tolerance: System steady-state and transient output performance remains within specified tolerances when steady-state ac input voltage varies plus 10, minus 20 percent from nominal voltage.
 - D. Overall UPS Efficiency: Equal to or greater than 97 percent at 100 percent load, 98 percent at 75 percent load, and 96 percent at 50 percent load.
 - E. Maximum Acoustical Noise: 67 dBA, "A" weighting, emanating from any UPS component under any condition of normal operation, measured 3feet from nearest surface of component enclosure.
 - F. Maximum Energizing Inrush Current: 6 times the full-load current.
 - G. Maximum AC Output-Voltage Regulation for Loads up to 50 Percent Unbalanced: Plus or minus 2 percent over the full range of battery voltage.
 - H. Output Frequency: 60 Hz, plus or minus 0.5 percent over the full range of input voltage, load, and battery voltage.
 - I. Limitation of harmonic distortion of input current to the UPS shall be as follows:
 1. Description: Either a tuned harmonic filter or an arrangement of rectifier-charger circuits shall limit THD to 5 percent, maximum, at rated full UPS load current, for power sources with X/R ratio between 2 and 30.
 - J. Maximum Harmonic Content of Output-Voltage Waveform: 5 percent rms total and 3 percent rms for any single harmonic, for 100 percent rated nonlinear load current with a load crest factor of 3.0.
 - K. Minimum Overload Capacity of UPS at Rated Voltage: 120 percent of rated full load for 10 minutes, and 150 percent for 30 seconds in all operating modes.

- L. Maximum Output-Voltage Transient Excursions from Rated Value: For the following instantaneous load changes, stated as percentages of rated full UPS load, voltage shall remain within stated percentages of rated value and recover to, and remain within, plus or minus 2 percent of that value within 100 ms:
 - 1. 50 Percent: Plus or minus 5 percent.
 - 2. 100 Percent: Plus or minus 5 percent.
 - 3. Loss of AC Input Power: Plus or minus 1 percent.
 - 4. Restoration of AC Input Power: Plus or minus 1 percent.
- M. Input Power Factor: A minimum of 0.80 lagging when supply voltage and current are at nominal rated values and the UPS is supplying rated full-load current.
- N. EMI Emissions: Comply with FCC Rules and Regulations and with 47 CFR 15 for Class A equipment.

2.3 UPS SYSTEMS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide central battery system for emergency lighting or comparable product by one of the following:
 - 1. Eaton Corporation; Powerware Division.
 - 2. Liebert Corporation; a division of Emerson.
 - 3. MGE UPS SYSTEMS.
- B. Electronic Equipment: Solid-state devices using hermetically sealed, semiconductor elements. Devices include rectifier-charger, inverter, static bypass transfer switch, and system controls.
- C. Enclosures: Comply with NEMA 250, Type 12, unless otherwise indicated.
- D. Control Assemblies: Mount on modular plug-ins, readily accessible for maintenance.
- E. Surge Suppression: Protect internal UPS components from surges that enter at each ac power input connection including main disconnect switch, static bypass transfer switch and maintenance bypass/isolation switch. Protect rectifier-charger, inverter, controls, and output components.
 - 1. Use factory-installed surge suppressors tested according to IEEE C62.41.1 and IEEE C62.41.2, Category B.
 - 2. Additional Surge Protection: Protect internal UPS components from low-frequency, high-energy voltage surges described in IEEE C62.41.1 and IEEE C62.41.2. Design the circuits connecting with external power sources and select circuit elements, conductors, conventional surge suppressors, and rectifier components and controls so input assemblies will have adequate mechanical strength and thermal and current-carrying capacity to withstand stresses imposed by 40-Hz, 180 percent voltage surges described in IEEE C62.41.1 and IEEE C62.41.2.
- F. Seismic-Restraint Design: UPS assemblies, subassemblies, and components (and fastenings and supports, mounting, and anchorage devices for them) shall be designed and fabricated to withstand static and seismic forces.
- G. UPS Cabinet Ventilation: Redundant fans or blowers draw in ambient air near the bottom of cabinet and discharge it near the top rear.

- H. Output Circuit Neutral Bus, Conductor, and Terminal Ampacity: Rated phase current times a multiple of 1.73, minimum.

2.4 RECTIFIER-CHARGER

- A. Capacity: Adequate to supply the inverter during rated full output load conditions and simultaneously recharge the battery from fully discharged condition to 95 percent of full charge within 10 times the rated discharge time for duration of supply under battery power at full load.
- B. Output Ripple: Limited by output filtration to less than 0.5 percent of rated current, peak to peak.
- C. Control Circuits: Immune to frequency variations within rated frequency ranges of normal and emergency power sources.
 - 1. Response Time: Field adjustable for maximum compatibility with local generator-set power source.
- D. Battery Float-Charging Conditions: Comply with battery manufacturer's written instructions for battery terminal voltage and charging current required for maximum battery life.

2.5 INVERTER

- A. Description: Pulse-width modulated, with sinusoidal output. Include a bypass phase synchronization window adjustment to optimize compatibility with local engine-generator-set power source.

2.6 STATIC BYPASS TRANSFER SWITCH

- A. Description: Solid-state switching device providing uninterrupted transfer. A contactor or electrically operated circuit breaker automatically provides electrical isolation for the switch.
- B. Switch Rating: Continuous duty at the rated full UPS load current, minimum.

2.7 BATTERY

- A. Description: Valve-regulated, premium, heavy-duty, recombinant, lead-calcium units; factory assembled in an isolated compartment or in a separate matching cabinet, complete with battery disconnect switch.
 - 1. Arrange for drawout removal of battery assembly from cabinet for testing and inspecting.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
 - 1. Encore
 - 2. C&D Technologies, Inc.; Standby Power Division.
 - 3. Eaton Corporation; Powerware Division.
 - 4. EnerSys.
- C. Seismic-Restraint Design: Battery racks, cabinets, assemblies, subassemblies, and components (and fastenings and supports, mounting, and anchorage devices for them) shall be designed and fabricated to withstand static and seismic forces.

2.8 CONTROLS AND INDICATIONS

- A. Description: Group displays, indications, and basic system controls on a common control panel on front of UPS enclosure.
- B. Minimum displays, indicating devices, and controls include those in lists below. Provide sensors, transducers, terminals, relays, and wiring required to support listed items. Alarms include audible signals and visual displays.
- C. Indications: Plain-language messages on a digital LCD or LED.
1. Quantitative indications shall include the following:
 - a. Input voltage, each phase, line to line.
 - b. Input current, each phase, line to line.
 - c. Bypass input voltage, each phase, line to line.
 - d. Bypass input frequency.
 - e. System output voltage, each phase, line to line.
 - f. System output current, each phase.
 - g. System output frequency.
 - h. DC bus voltage.
 - i. Battery current and direction (charge/discharge).
 - j. Elapsed time discharging battery.
 2. Basic status condition indications shall include the following:
 - a. Normal operation.
 - b. Load-on bypass.
 - c. Load-on battery.
 - d. Inverter off.
 - e. Alarm condition.
 3. Alarm indications shall include the following:
 - a. Bypass ac input overvoltage or undervoltage.
 - b. Bypass ac input overfrequency or underfrequency.
 - c. Bypass ac input and inverter out of synchronization.
 - d. Bypass ac input wrong-phase rotation.
 - e. Bypass ac input single-phase condition.
 - f. Bypass ac input filter fuse blown.
 - g. Internal frequency standard in use.
 - h. Battery system alarm.
 - i. Control power failure.
 - j. Fan failure.
 - k. UPS overload.
 - l. Battery-charging control faulty.
 - m. Input overvoltage or undervoltage.
 - n. Input transformer overtemperature.
 - o. Input circuit breaker tripped.
 - p. Input wrong-phase rotation.
 - q. Input single-phase condition.
 - r. Approaching end of battery operation.
 - s. Battery undervoltage shutdown.
 - t. Maximum battery voltage.

- u. Inverter fuse blown.
- v. Inverter transformer overtemperature.
- w. Inverter overtemperature.
- x. Static bypass transfer switch overtemperature.
- y. Inverter power supply fault.
- z. Inverter transistors out of saturation.
- aa. Identification of faulty inverter section/leg.
- bb. Inverter output overvoltage or undervoltage.
- cc. UPS overload shutdown.
- dd. Inverter current sensor fault.
- ee. Inverter output contactor open.
- ff. Inverter current limit.

4. Controls shall include the following:

- a. Inverter on-off.
- b. UPS start.
- c. Battery test.
- d. Alarm silence/reset.
- e. Output-voltage adjustment.

D. Dry-form "C" contacts shall be available for remote indication of the following conditions:

- 1. UPS on battery.
- 2. UPS on-line.
- 3. UPS load-on bypass.
- 4. UPS in alarm condition.
- 5. UPS off (maintenance bypass closed).

2.9 MAINTENANCE BYPASS/ISOLATION SWITCH

A. Description: Manually operated switch or arrangement of switching devices with mechanically actuated contact mechanism arranged to route the flow of power to the load around the rectifier-charger, inverter, and static bypass transfer switch.

- 1. Switch shall be electrically and mechanically interlocked to prevent interrupting power to the load when switching to bypass mode.
- 2. Switch shall electrically isolate other UPS components to permit safe servicing.

B. Switch Rating: Continuous duty at rated full UPS load current.

2.10 OUTPUT ISOLATION TRANSFORMER

A. Description: Shielded unit with low forward transfer impedance up to 3 kHz, minimum. Include the following features:

- 1. Comply with applicable portions of UL 1561, including requirements for nonlinear load current-handling capability for a K-factor of approximately 4.
- 2. Output Impedance at Fundamental Frequency: Between 3 and 4 percent.
- 3. Regulation: 5 percent, maximum, at rated nonlinear load current.
- 4. Full-Load Efficiency at Rated Nonlinear Load Current: 96 percent, minimum.
- 5. Electrostatic Shielding of Windings: Independent for each winding.
- 6. Coil Leads: Physically arranged for minimum interlead capacitance.
- 7. Shield Grounding Terminal: Separately mounted; labeled "Shield Ground."

8. Capacitive Coupling between Primary and Secondary: 33 picofarads, maximum, over a frequency range of 20 Hz to 1 MHz.

2.11 MONITORING BY REMOTE STATUS AND ALARM PANEL

- A. Description: Labeled LEDs on panel faceplate indicate five basic status conditions. Audible signal indicates alarm conditions. Silencing switch in face of panel silences signal without altering visual indication.
 1. Cabinet and Faceplate: Surface or flush mounted to suit mounting conditions indicated.

2.12 MONITORING BY REMOTE COMPUTER

- A. Description: Communication module in unit control panel provides capability for remote monitoring of status, parameters, and alarms specified in "Controls and Indications" Article. The remote computer and the connecting signal wiring are not included in this Section. Include the following features:
 1. Connectors and network interface units or modems for data transmission via RS-232 link.
 2. Software designed for control and monitoring of UPS functions and to provide on-screen explanations, interpretations, diagnosis, action guidance, and instructions for use of monitoring indications and development of meaningful reports. Permit storage and analysis of power-line transient records. Designs for Windows applications, software, and computer are not included in this Section.

2.13 BASIC BATTERY MONITORING

- A. Battery Ground-Fault Detector: Initiates alarm when resistance to ground of positive or negative bus of battery is less than 5000 ohms.
- B. Battery compartment smoke/high-temperature detector initiates an alarm when smoke or a temperature greater than 75 deg C occurs within the compartment.
- C. Annunciation of Alarms: At UPS control panel.

2.14 SOURCE QUALITY CONTROL

- A. Factory test complete UPS system before shipment. Use simulated battery testing. Include the following:
 1. Test and demonstration of all functions, controls, indicators, sensors, and protective devices.
 2. Full-load test.
 3. Transient-load response test.
 4. Overload test.
 5. Power failure test.
- B. Observation of Test: Give 14 days' advance notice of tests and provide opportunity for City of New York's representative to observe tests at City of New York's choice.
- C. Report test results. Include the following data:
 1. Description of input source and output loads used. Describe actions required to simulate source load variation and various operating conditions and malfunctions.

2. List of indications, parameter values, and system responses considered satisfactory for each test action. Include tabulation of actual observations during test.
3. List of instruments and equipment used in factory tests.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for conditions affecting performance of the UPS.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Equipment Mounting: Install UPS on concrete base. Comply with requirements for concrete base specified in Division 03 Section Cast-in-Place Concrete.
 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
- B. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.
- C. Connections: Interconnect system components. Make connections to supply and load circuits according to manufacturer's wiring diagrams unless otherwise indicated.

3.3 GROUNDING

- A. Separately Derived Systems: If not part of a listed power supply for a data-processing room, comply with NFPA 70 requirements for connecting to grounding electrodes and for bonding to metallic piping near isolation transformer.

3.4 IDENTIFICATION

- A. Identify components and wiring according to Division 26 Section "Identification for Electrical Systems."

3.5 BATTERY EQUALIZATION

- A. Equalize charging of battery cells according to manufacturer's written instructions. Record individual-cell voltages.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections.

1. **Manufacturer's Field Service:** Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. **Tests and Inspections:**
1. Comply with manufacturer's written instructions.
 2. Inspect interiors of enclosures, including the following:
 - a. Integrity of mechanical and electrical connections.
 - b. Component type and labeling verification.
 - c. Ratings of installed components.
 3. Inspect batteries and chargers according to requirements in NETA Acceptance Testing Specifications.
 4. Test manual and automatic operational features and system protective and alarm functions.
 5. Load the system using a variable-load bank to simulate kilovolt amperes, kilowatts, and power factor of loads for unit's rating.
 - a. Simulate malfunctions to verify protective device operation.
 - b. Test duration of supply on emergency, low-battery voltage shutdown, and transfers and restoration due to normal source failure.
 - c. Test harmonic content of input and output current less than 25, 50, and 100 percent of rated loads.
 - d. Test output voltage under specified transient-load conditions.
 - e. Test efficiency at 50, 75, and 100 percent of rated loads.
 - f. Test remote status and alarm panel functions.
 - g. Test battery-monitoring system functions.
- C. **Seismic-restraint tests and inspections shall include the following:**
1. Inspect type, size, quantity, arrangement, and proper installation of mounting or anchorage devices.
 2. Test mounting and anchorage devices according to requirements in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- D. The UPS system will be considered defective if it does not pass tests and inspections.
- E. **Record of Tests and Inspections:** Maintain and submit documentation of tests and inspections, including references to manufacturers' written instructions and other test and inspection criteria. Include results of tests, inspections, and retests.
- F. Prepare test and inspection reports.
- G. Contractors' tests shall be scheduled and documented in accordance with the commissioning requirements. Refer to Section 019100, Commissioning, for further details.
- H. System verification testing is part of the Commissioning Process. Verification testing shall be performed by the contractor and witnessed and documented by the Commissioning Agent. Refer to Section 019100, Commissioning, for system verification tests and commissioning requirements.

3.7 PERFORMANCE TESTING

- A. Monitoring and Testing Instruments: Three-phase, recording, power monitors. Instruments shall provide continuous simultaneous monitoring of electrical parameters at UPS input terminals and at input terminals of loads served by the UPS. Instruments shall monitor, measure, and graph voltage current and frequency simultaneously and provide full-graphic recordings of the values of those parameters before and during power-line disturbances that cause the values to deviate from normal beyond the adjustable threshold values. Instruments shall be capable of recording either on paper or on magnetic media and have a minimum accuracy of plus or minus 2 percent for electrical parameters. Parameters to be monitored include the following:
1. Current: Each phase and neutral and grounding conductors.
 2. Voltage: Phase to phase, phase to neutral, phase to ground, and neutral to ground.
 3. Frequency transients.
 4. Voltage swells and sags.
 5. Voltage Impulses: Phase to phase, phase to neutral, phase to ground, and neutral to ground.
 6. High-frequency noise.
 7. Radio-frequency interference.
 8. THD of the above currents and voltages.
 9. Harmonic content of currents and voltages above.
- B. Monitoring and Testing Assistance by Contractor:
1. Open UPS and electrical distribution and load equipment and wiring enclosures to make monitoring and testing points accessible for temporary monitoring probe and sensor placement and removal as requested.
 2. Observe monitoring and testing operations; ensure that UPS and distribution and load equipment warranties are not compromised.
 3. Perform switching and control of various UPS units, electrical distribution systems, and load components as directed by power quality specialist. Specialist shall design this portion of monitoring and testing operations to expose the UPS to various operating environments, conditions, and events while response is observed, electrical parameters are monitored, and system and equipment deficiencies are identified.
 4. Make repairs and adjustments to the UPS and to electrical distribution system and load components, and retest and repeat monitoring as needed to verify validity of results and correction of deficiencies.
 5. Engage the services of the UPS manufacturer's factory-authorized service representative periodically during performance testing operations for repairs, adjustments, and consultations.
- C. Documentation: Record test point and sensor locations, instrument settings, and circuit and load conditions for each monitoring summary and power disturbance recording. Coordinate simultaneous recordings made on UPS input and load circuits.
- D. Analysis of Recorded Data and Report: Review and analyze test observations and recorded data and submit a detailed written report. Include the following report:
1. Description of corrective actions performed during monitoring and survey work and their results.
 2. Recommendations for further action to provide optimum performance by the UPS and appropriate power quality for non-UPS loads. Include a statement of priority ranking and a cost estimate for each recommendation that involves system or equipment revisions.

3. Copies of monitoring summary graphics and graphics illustrating harmonic content of significant voltages and currents.
 4. Copies of graphics of power disturbance recordings that illustrate findings, conclusions, and recommendations.
 5. Recommendations for operating, adjusting, or revising UPS controls.
 6. Recommendation for alterations to the UPS installation.
 7. Recommendations for adjusting or revising generator-set or automatic transfer switch installations or their controls.
 8. Recommendations for power distribution system revisions.
 9. Recommendations for adjusting or revising electrical loads, their connections, or controls.
- E. Interim and Final Reports: Provide an interim report at the end of each test period and a final comprehensive report at the end of final test and analysis period.
- F. System verification testing is part of the Commissioning Process. Verification testing shall be performed by the contractor and witnessed and documented by the Commissioning Agent. Refer to Section 019100, Commissioning, for system verification tests and commissioning requirements.
- 3.8 DEMONSTRATION
- A. Engage a factory-authorized service representative to train City of New York's maintenance personnel to adjust, operate, and maintain the UPS.

END OF SECTION 263353

SECTION 26 43 13 - TRANSIENT-VOLTAGE SUPPRESSION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes field-mounted TVSS for low-voltage (120 to 480 V) power distribution and control equipment.
- B. Related Sections:
 - 1. Division 26 Section "Switchboards" for factory-installed TVSS.
 - 2. Division 26 Section "Panelboards" for factory-installed TVSS.
 - 3. Division 26 Section "Wiring Devices" for devices with integral TVSS.

1.3 DEFINITIONS

- A. ATS: Acceptance Testing Specifications.
- B. SVR: Suppressed voltage rating.
- C. TVSS: Transient voltage surge suppressor(s), both singular and plural; also, transient voltage surge suppression.
- D. SPD: Surge Protection Device
- E. NTRL: Nationally Recognized Testing Laboratory
- F. TOV: Temporary Over Voltage

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating weights, operating characteristics, furnished specialties, and accessories. Include listed documents:
 - 1. SVR ratings
 - 2. Symmetrical fault current withstand ratings
 - 3. Independent third Party Test Lab report showing device is capable of surviving specified number of 8x20us waveform.

4. The service entrance SPD should also be able to demonstrate survival of multiple TOV events as specified.
- B. Product Certificates: For SPDs, signed by third-party NRTL testing agencies certifying compliance with the following standards:
1. American National Standards Institute (ANSI)/Institute of Electrical & Electronic Engineers (IEEE)
 - a. C62.41.1: 2002 IEEE Guide on the Surge Environment in Low-Voltage (1000V and less) AC Power Circuits.
 - b. C62.41.2: 2002 IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000V and Less) AC Power Circuits
 - c. C62.45: 2002 IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000V and Less) AC Power Circuits
 - d. C62.62: 2000 IEEE Standard Test Specifications for Surge Protective Devices for Low Voltage (1000V and Less) AC Power Circuits
 - e. C62.72: 2007 IEEE Guide for the Application of Surge Protective Devices for Low Voltage (1000V and Less) AC Power Circuits
 2. Underwriters Laboratory (UL)
 - a. UL1449 3rd Edition: Surge Protective Devices (SPD/TVSS)
 - b. UL1283 5th Edition: Electromagnetic Interference Filters
 - c. UL796 9th Edition: Printed Wiring Boards
 - d. UL67 11th Edition: UL Standard for Safety for Panelboards
 - e. cUL – UL: Evaluation to Canadian Safety Requirements
 3. IEEE C62.34 Secondary Surge Arrester.
 4. Occupational Safety and Health Act (OSHA)
 5. NEMA LS-1 (1992) Low Voltage Surge Protective Devices.
- C. Field quality-control reports.
- D. Operation and Maintenance Data: For TVSS devices to include in emergency, operation, and maintenance manuals.
- E. Warranties: Sample of special warranties.
- 1.5 QUALITY ASSURANCE
- A. Testing Agency Qualifications: An independent testing agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Source Limitations: Obtain suppression devices and accessories through one source from a single manufacturer.
- C. Product Options: Drawings indicate size, dimensional requirements, and electrical performance of suppressors and are based on the specific system indicated
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- E. Comply with IEEE C62.41, "IEEE Guide for Surge Voltages in Low Voltage AC Power Circuits," and test devices according to IEEE C62.45, "IEEE Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits."
- F. Comply with NEMA LS 1 1992, "Low Voltage Surge Protection Devices."
- G. Comply with UL 1283, "Electromagnetic Interference Filters,"
- H. Comply with UL 1449, "Transient Voltage Surge Suppressors." and listed as a SPD device.
- I. Tested and listed by a NRTL as a complete assembly to a symmetrical fault current rating greater than or equal to the rating of the connected panel, in accordance with NEC Article 285
- J. Fed by a fuse or circuit breaker in Panel Board with SVR rating to include fuse or breaker in series with SPD.
- K. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency, and marked for intended location and application.
- L. Comply with IEEE C62.41.2 and test devices according to IEEE C62.45.

1.6 COORDINATION

- A. Coordinate location of field-mounted TVSS devices to allow adequate clearances for maintenance.

1.7 WARRANTY

- A. All Surge Protective Devices (SPD/TVSS), associated hardware, and supporting components shall be warranted to be free from defects in materials and workmanship, under normal use and in accordance with the instructions provided, for a period of five (5) years.
- B. Any component or subassembly contained within the surge protection system that shows evidence of failure or incorrect operation during the five (5) year warranty period, shall be replaced by the manufacturer.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The following are the general requirements of the SPD/TVSS products:
1. Nomenclatures used herein are intended to indicate product type and configuration of equipment required.
 2. UL1449 3rd Edition Listed and must bear the 3rd Edition mark.
 3. UL1283 5th Edition Listed.
 4. The Surge Protective Device (SPD/TVSS) shall be a stand alone configuration. Systems that must be integral to the switchgear will not be considered.
 5. The surge protection system shall provide effective high-energy.
 6. Transient Voltage Suppression and attenuate high frequency electrical noise.
 7. All suppression systems must be permanently connected, parallel designs. Series suppression elements are not acceptable.
 8. Short Circuit Current Rating "SCCR" of 100kAIC without the need for fuses or breakers external to the SPD/TVSS. NEC Article 285.6 requires test data confirming the specified short circuit carrying capability (AIC rating) is provided.
 9. All SPD/TVSS units shall be provided with an auxiliary dry contact (Form C) actuated by any single suppression module including N-G failure for connection to a Building Automation System.
 10. All SPD/TVSS units shall be from the same manufacturer.
 11. SPD/TVSS modules shall be configured to isolate individual suppression component failures without causing total loss of surge protection in that mode.
 12. Surge protection or filtering component failures or fuse openings are not permissible during UL1449 3rd Edition Nominal Discharge testing.
 13. SPD/TVSS designs using a single fuse to protect two (2) or more surge paths are not acceptable.
 14. Surge Protection system designs that limit the 100% rated surge protection are not acceptable.
 15. Fuse links or printed circuit board trace fusing are not acceptable.
 16. The SPD/TVSS shall provide redundant parallel copper bus structure and/or low impedance traces, which are 100% surge rated top and bottom of printed circuit board to reduce suppression path impedance.
 - a. All printed circuit boards are heavy copper double-sided plated through and meet the requirements of UL796 including those for Direct Support applications, as indicated by a Delta symbol on the circuit board.
 - b. Hybrid design utilizing:

- 1) Thermally Protected Metal Oxide Varistors (TPMOV or equivalent) featuring:
 - a) "Fail-safe" design technology with integrated thermal apparatus that monitors the status providing local physical indication of the metal oxide disk has built-in dielectric (arc shield) protection and remote indication by an integral N.O micro-switch.
 - b) The TPMOV or equivalent eliminates the requirement of internal or external fuses (which would limit surge protection capability) for the surge protection components, while providing a Short Circuit Current Rating (SCCR) of 100,000 Amps.
- 2) Filter capacitors to suppress EMI/RFI electrical noise.

17. All products shall be provided with high strand count, high frequency/low impedance wire.

18. Products which are encapsulated in an epoxy resin compound or any other compound of similar form are not acceptable.

2.2 SERVICE ENTRANCE SUPPRESSORS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following but are not limited to, the following:
 1. Thor Systems TSr Product Series
 2. Current Technologies SL2 Product Series
 3. Liebert Interceptor II Serie

2.3 SERVICE ENTRANCE SPD

- A. Configured for the voltage configuration as shown on plans.
- B. A modular hybrid design utilizing the following UL Recognized components:
 1. Thermally Protected Metal Oxide Varistors (TPMOV or equivalent) utilizing "fail-safe" technology. (Systems using fuse links or printed circuit board trace fusing are not acceptable.)
 2. EMI/RFI Filter Capacitors which are UL1283 Listed having an electrical noise attenuation of 36 to 44dB in the range of 50kHz to 100MHz as defined by MIL-STD-220A test procedures.
- C. Each module is voltage keyed by color, by numerical identification, and coordinating pin and sleeve to assure correct assembly field replacement.
- D. The modular design is available for the complete range of surge ratings (100 through 300), featuring a full complement surge rating on each field replaceable module.
- E. Modes of Protection: The SPD/TVSS system shall provide surge protection in all possible modes (L-N, L-G, L-L, and N-G). Each replaceable module must provide the uncompromising ability to deliver full surge current rating from 50kA to 300kA per mode.
- F. Connection method: Fused disconnect

- G. The replaceable module must be an individual module (one [1] module per mode). Each system must provide a spare module. Modular designs with only a single module or surge brick are not acceptable.
- H. Each individual module features a green LED indicating the individual module has all surge protection devices active. If any single component is taken off-line, the green LED will turn off and a red LED will illuminate, providing individual module as well as total system status indication.
- I. Monitoring: Surge Counter with 8 Programmable Sensitivity Levels (includes Audible Alarm with Silence [ACK] Button)
- J. Provide the SPD/TVSS in a NEMA 4 enclosure not exceeding 20"H x 16"W x 8"D in size.
- K. Each replaceable module, having parallel copper circuit board surge-rated traces designed for 100% rating of the suppression element, shall bolt directly to a low impedance solid copper bus structure. Modular systems with plug-in component modules are not acceptable.
- L. Each SPD/TVSS system shall be supplied with one (1) field replaceable module.
- M. All Modular units are provided with thirty feet (30') of #6 AWG High Voltage Wire (low impedance, high frequency/50kHz, 15kV insulation and 133 strands).
- N. The let-through voltage test results used to obtain the UL1449 3rd Edition Voltage Performance Ratings "VPR" (6kV, 3000 Amps, 8/20 μ s waveform) must not exceed the UL assigned values listed below.
- | | | | |
|----|--------------------|---------------------|----------------------|
| 1. | Line to Neutral: | 1200 V for 480/277V | 900 V for 208/120V. |
| 2. | Line to Ground: | 1200 V for 480/277V | 800 V for 208/120V. |
| 3. | Neutral to Ground: | 1200 V for 480/277V | 700 V for 208/120V. |
| 4. | Line to Line: | 2000V for 480/277V | 1200 V for 208/120V. |
- O. Peak Single-Impulse Surge Current Rating:
1. Switchboard rated 3200 Amps and above; 300 kA per mode/600 kA per phase
 2. Switchboard rated 2000 Amps and above; 250 kA per mode/500 kA per phase
 3. Switchboard rated 1200 Amps and above; 200 kA per mode/400 kA per phase

2.4 DISTRIBUTION PANELBOARD SUPPRESSORS

- A. This section describes the specific requirements of Non-modular SPD/TVSS devices required on this project.
1. Configured for the voltage configuration as shown on plans.
 2. Provides parallel copper circuit board surge-rated traces as the primary suppression path. Each path is designed for 100% rating of the suppression element.
 3. A non-modular hybrid design utilizing the following UL Recognized components:
 4. Thermally Protected Metal Oxide Varistors (TPMOV or equivalent) utilizing "fail-safe" technology. (Systems using fuse links or printed circuit board trace fusing are not acceptable.)
 - a. EMI/RFI Filter Capacitors which are UL1283 Listed having an electrical noise attenuation of 32 to 37dB in the range of 50kHz to 100MHz as defined by MIL-STD-220A test procedures.
 - b. The non-modular design is non-field replaceable, offered in 50kA, 100kA, and 150kA/mode surge protection ratings.

- B. The non-modular SPD/TVSS is provided in a compact NEMA 4X Polycarbonate enclosure with a CLEAR cover enhancing both the functionality and the aesthetics of the products.
- C. Continuous LED indication of the system integrity (including N-G mode) utilizing a Green and Red solid state LED with 200,000 hour rated life is standard.
- D. Monitoring: Surge Counter with 8 Programmable Sensitivity Levels (includes Audible Alarm with Silence [ACK] Button)
- E. All non-modular units are factory wired using #10AWG low impedance, high frequency wire: two feet (2') for each phase conductor and three feet (3') for Neutral and Ground conductors.
- F. The let-through voltage test results used to obtain the UL1449 3rd Edition Voltage Performance Ratings "VPR" (6kV, 3000 Amps, 8/20 μ s waveform) must not exceed the UL assigned values listed below.
- | | | | |
|----|--------------------|---------------------|----------------------|
| 1. | Line to Neutral: | 1200 V for 480/277V | 700 V for 208/120V. |
| 2. | Line to Ground: | 1200 V for 480/277V | 700 V for 208/120V. |
| 3. | Neutral to Ground: | 900 V for 480/277V | 800 V for 208/120V. |
| 4. | Line to Line: | 2000 V for 480/277V | 1200 V for 208/120V. |
- G. Peak Single-Impulse Surge Current Rating:
1. Distribution Panelboard rated 600 Amps and above; 200 kA per mode/400 kA per phase
 2. Distribution Panelboard rated 400 Amps and below; 150 kA per mode/300 kA per phase
- H. Approved Manufacturers: The following NON-MODULAR SPD/TVSS models are acceptable, subject to conformance with indicated requirements:
- | | | |
|----|----------------------|----------------------------|
| 1. | THOR SYSTEMS | TSn Product Series |
| 2. | Current Technologies | TG Product Series |
| 3. | Liebert | Accuvar All Product Series |

2.5 PANELBOARD SUPPRESSORS

- A. This section describes the specific requirements of Lighting & Appliance Panelboard surge suppressor devices needed on this project.
1. Configured for the voltage configuration as shown on plans.
 2. Provides parallel copper circuit board surge-rated traces as the primary suppression path. Each path is designed for 100% rating of the suppression element.
 3. A hybrid design utilizing the following UL Recognized components:
 - a. Thermally Protected Metal Oxide Varistors (TPMOV or equivalent) utilizing "fail-safe" technology. (Systems using fuse links or printed circuit board trace fusing are not acceptable.)
 - b. EMI/RFI Filter Capacitors which are UL1283 Listed having an electrical noise attenuation of 32 to 37dB in the range of 50kHz to 100MHz as defined by MIL-STD-220A test procedures.
- B. Provides Surge Protective Device SPD/TVSS in a UL67 Listed Accessory Box not to exceed 20"W x 9"H x 5-3/4"D in size which mounts to the top or bottom end of the panelboard. Devices that mount directly to the bus bar are not acceptable.

- C. The UL67 Listed Accessory Box is provided with a surface or flush cover, based upon the specific panelboard application.
- D. The SPD/TVSS device must be self-contained in a NEMA 4X enclosure to prevent bus contamination in the event of a surge event failure.
- E. Provides a 30A breaker in the Panelboard to feed the SPD/TVSS.
- F. The SPD/TVSS device shall be replaceable without exposure to live parts or without having to de-energize the panel.
- G. Provides visual LED indications of the SPD/TVSS status without the need to remove the surface or flush cover.
- H. Monitoring: Surge Counter with 8 Programmable Sensitivity Levels (includes Audible Alarm with Silence [ACK] Button)
- I. The let-through voltage test results used to obtain the UL 1449 3rd Edition Voltage Performance Ratings "VPR" (6kV, 3000 Amps, 8/20 μ s waveform) must not exceed the UL assigned values listed below.

1. Line to Neutral:	1200 V for 480/277V	700 V for 208/120V.
2. Line to Ground:	1200 V for 480/277V	700 V for 208/120V.
3. Neutral to Ground:	900 V for 480/277V	800 V for 208/120V.
4. Line to Line:	1800 V for 480/277V	1000 V for 208/120V.

J. Peak Single-Impulse Surge Current Rating:

- 1. Panelboards rated 400 Amps & above 150 kA per mode/300 kA per phase.
- 2. Panelboards rated 225 Amps Buss 100 kA per mode/200 kA per phase.
- 3. Panelboards rated 100 Amps Buss 100 kA per mode/200 kA per phase.

K. Approved Manufacturers: The following Lighting & Appliance Panelboard models are acceptable, subject to conformance with indicated requirements:

- 1. THOR SYSTEMS TSp Product
- 2. Current Technologies EGP Product
- 3. Liebert PanelGuard Product

2.6 PERFORMANCE

- A. Provide a Test Report from a recognized independent testing laboratory (NETA or NRTL) verifying the COMPLETE suppressor (including all necessary fusing, disconnects, monitoring systems, etc.) can survive published current rating on a per mode basis using the IEEE C62.41, 8/20 μ s waveform. Note that test data on individual module is not acceptable.
- B. Provide a COMPLETE documentation package per the requirements of NEMA LS1-1992.
- C. The SPD/TVSS shall be capable of surviving the UL 1449 3rd Edition Nominal Discharge Test. The repetitive surge current capacity shall be tested utilizing an 8x20 μ s, 20kA short circuit test waveform (as defined by ANSI/UL 1449 3rd Edition – 2009, IEEE C62.41.2 – 2002 and IEEE C62.45 – 2002). Surges shall be applied in three (3) groups of five (5) surges. Within one (1) second after the application of each surge, the specified MCOV shall be applied for sixty (60) seconds (\pm 15 seconds). After each group of five (5) surges, the sample shall rest for thirty (30)

minutes. After the 15th surge, the MCOV shall be reapplied for at least fifteen (15) minutes. During and following this test there shall be no opening of any supplementary protective devices either internal or external to the device.

- D. The SPD/TVSS must provide superior surge protection performance with the ability to deliver 100% rated surge capacity.
- E. The Surge protection system must be rated and marked with a Short Circuit Current Rating (SCCR) of 100kAic without the need for external fuses or breakers. The use of Overcurrent protection that limits the specified surge currents is not acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install TVSS devices at service entrance on load side, with ground lead bonded to service entrance ground.
- B. Equipment shall be installed following manufacturer's recommendations and guidelines in compliance with NEC Article 280/250 for grounding and bonding; NEC Article 110-9 and 110-10 for over-current protection.
- C. All TVSS devices specified in this specification section shall be designed and installed such that normal operation of the system shall not be impaired by the installation of these devices.
- D. Suppressors shall be installed as close as practical to the electric panel to be protected, consistent with available space.
- E. For Dual Rated Surge Protection (listed as both Surge Arrestor and SPD) for service entrance, product can be placed on either Line or Load side of the Service Entrance Panel.
- F. For all remaining SPD devices:
 - 1. Provide multi-pole (30amp min 200amp max) circuit breaker or specify the protector with an integrated disconnect
- G. Install devices for panelboard and auxiliary panels with conductors or buses between suppressor and points of attachment as short and straight as possible. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground. SPD shall not be integrated with Switchgear or Switchboard as recommended by IEEE-1100, Section 8.4.2.5.
- H. All SPDs shall have the raceway between the SPD and switchgear enclosure sealed with approved fire sealant as specified under Div. 26 for this project. The sealant shall prevent vapors from entering the switchgear enclosure.

3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, "Surge Arresters, Low-Voltage Surge Protection Devices" Section. Certify compliance with test parameters.

2. After installing TVSS devices but before electrical circuitry has been energized, test for compliance with requirements.
 3. Complete startup checks according to manufacturer's written instructions.
- B. TVSS device will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.3 STARTUP SERVICE

1. Do not energize or connect electrical equipment to their sources until TVSS devices are installed and connected.
2. Do not perform insulation resistance tests of the distribution wiring equipment with the TVSS installed. Disconnect before conducting insulation resistance tests, and reconnect immediately after the testing is over.

3.4 SYSTEM COMMISSIONING.

- A. Upon completion of the installation of the Surge Protective Device (SPD/TVSS) a factory-authorized service representative shall provide product commissioning services. These services shall include but are not limited to the following:
1. Before energizing the SPD/TVSS verify the SPD/TVSS is correct as specified: manufacturer, product series, and model number.
 - a. All voltage modes including L-L (Line-to-Line), L-G (Line-to-Ground), L-N (Line-to-Neutral), and N-G (Neutral-to-Ground) shall be measured and verified against the unit voltage ratings.
 - b. Continuity measurements shall be made between the Neutral and Ground connections to verify the Neutral-to-Ground bond.
 - c. Use a calibrated Ground resistance meter to measure the Ground resistance of the Ground wire connected to each individual SPD/TVSS unit. Record the Ground reading in unit documentation. NOTE: The preferred reading is less than 5 Ohms. A Ground system measuring above 10 ohms needs to be evaluated.
 2. Energize the SPD/TVSS:
 - a. All voltage modes including L-L (Line-to-Line), L-G (Line-to-Ground), L-N (Line-to-Neutral), and N-G (Neutral-to-Ground) shall be measured at the unit terminals and again verified against the unit voltage ratings.
 - b. All indicating LEDs shall be illuminated Green. The factory shall be contacted in the event of any illuminated Red LEDs.
 - c. Monitoring functions shall be checked (if applicable) for correct operation and verification of sensitivity setting. Upon energizing the SPD/TVSS:
 - 1) The Yellow ACTIVE SURGE LED should turn On, then Off.
 - 2) The Green STATUS and Yellow ENABLE LEDs should turn On.
 - 3) When the Green and Yellow LEDs turn on, the Counter should display a sensitivity setting of SEN3, which is the factory default setting. The display should change to 0000.
 - 4) The Audible Alarm should sound on fault. ACK silences alarm. Note: The Alarm should be in the Enabled status unless the customer has requested the alarm not sound.

- 5) Results of the System Commissioning shall be on a standard Commissioning Report which is submitted upon completion to the facilities manager.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train City of New York's maintenance personnel to maintain TVSS devices.

END OF SECTION 264313

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SECTION 26 51 00 – INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior lighting fixtures, lamps, and ballasts.
 - 2. Emergency lighting units.
 - 3. Exit signs.
 - 4. Lighting fixture supports.
- B. Retrofit kits for fluorescent lighting fixtures.

1.3 DEFINITIONS

- A. BF: Ballast factor.
- B. CRI: Color-rendering index.
- C. CU: Coefficient of utilization.
- D. HID: High-intensity discharge.
- E. LER: Luminaire efficacy rating.
- F. Luminaire: Complete lighting fixture, including ballast housing if provided.
- G. RCR: Room cavity ratio.

1.4 SUBMITTALS

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
 - 1. Physical description of lighting fixture including dimensions.
 - 2. Emergency lighting units including battery and charger.
 - 3. Ballast.
 - 4. Energy-efficiency data.
 - 5. Air and Thermal Performance Data: For air-handling lighting fixtures, furnish data required.
 - 6. Sound Performance Data: For air-handling lighting fixtures. Indicate sound power level and sound transmission class in test reports.
 - 7. Life, output, and energy-efficiency data for lamps.

8. Photometric data, in IESNA format, based on laboratory tests of each lighting fixture type, outfitted with lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.
 - a. For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by the manufacturer.
 - b. Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program (NVLAP) for Energy Efficient Lighting Products.
- B. Shop Drawings: Show details of all lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.
 1. Wiring Diagrams: Power and control wiring as required.

1.5 QUALITY ASSURANCE

- A. The contractor or subcontractor performing the work of this section must within the last three (3) consecutive years prior to the bid opening, have successfully completed in a timely fashion projects similar in scope and type to the required work, including installation and maintenance.
- B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
- C. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- E. Comply with NFPA 70.
- F. FMG Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FMG.
- G. Mockups: Provide interior lighting fixtures for room or module mockups, complete with power and control connections.
 1. Obtain Commissioner's approval of fixtures for mockups before starting installations.
 2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 3. Approved fixtures in mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 COORDINATION

- A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.7 WARRANTY

- A. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
1. Warranty Period for Emergency Lighting Unit Batteries: Ten years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.
 2. Warranty Period for Emergency Fluorescent Ballast and Self-Powered Exit Sign Batteries: Seven years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining six years.
- B. Special Warranty for Ballasts: Manufacturer's standard form in which ballast manufacturer agrees to repair or replace ballasts that fail in materials or workmanship within specified warranty period.
1. Warranty Period for Ballasts: Five years from date of Substantial Completion.
- C. Special Warranty for T5 and T8 Fluorescent Lamps: Manufacturer's standard form, made out to The City of New York and signed by lamp manufacturer agreeing to replace lamps that fail in materials or workmanship, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
1. Warranty Period: One year(s) from date of Substantial Completion.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
 2. Battery and Charger: One for each emergency lighting unit.
 3. Ballasts: 1 for every 100 of each type and rating installed. Furnish at least one of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. For interior lighting fixtures, the following requirements apply to product selection:
1. Basis-of-Design Product: The design for each lighting fixture is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by another manufacturer.
 2. Other manufacturers: Refer to Submittals in Part 1 of this section for approval of manufacturers other than as specified. For fixtures by manufacturers other than as specified for each fixture, a sample is mandatory with submittal for approval.

2.2 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Incandescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.
- C. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.
- D. HID Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5B.
- E. Metal Parts: Free of burrs and sharp corners and edges.
- F. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
- G. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- H. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
 - 4. Laminated Silver Metallized Film: 90 percent.
- I. Plastic Diffusers, Covers, and Globes:
 - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - a. Lens Thickness: At least 0.125 inch minimum unless different thickness is indicated.
 - b. UV stabilized.
 - 2. Glass: Annealed crystal glass, unless otherwise indicated.
- J. Electromagnetic-Interference Filters: Factory installed to suppress conducted electromagnetic-interference as required by MIL-STD-461E. Fabricate lighting fixtures with one filter on each ballast indicated to require a filter.
- K. Air-Handling Fluorescent Fixtures: For use with plenum ceiling for air return and heat extraction and for attaching an air-diffuser-boot assembly.
 - 1. Air Supply Units: Slots in one or both side trims join with air-diffuser-boot assemblies.
 - 2. Heat Removal Units: Air path leads through lamp cavity.
 - 3. Combination Heat Removal and Air Supply Unit: Heat is removed through lamp cavity at both ends of the fixture door with air supply same as for air supply units.
 - 4. Dampers: Operable from outside fixture for control of return-air volume.
 - 5. Static Fixture: Air supply slots are blanked off, and fixture appearance matches active units.

- L. Wattage Label: Luminaires designed for operation of lamps below the rated enclosure, transformer, or ballast maximum shall be clearly marked with a label indicating the lamp wattage specified as the maximum lamp wattage allowable.

2.3 BALLASTS FOR LINEAR FLUORESCENT LAMPS

- A. Electronic Ballasts: Comply with ANSI C82.11; programmed-start type, unless otherwise indicated, and designed for type and quantity of lamps served. Ballasts shall be designed for full light output unless dimmer or bi-level control is indicated.
 - 1. Sound Rating: A.
 - 2. Total Harmonic Distortion Rating: Less than 10 percent.
 - 3. Transient Voltage Protection: IEEE C62.41, Category A or better.
 - 4. Operating Frequency: 20 kHz or higher.
 - 5. Lamp Current Crest Factor: 1.7 or less.
 - 6. BF: 0.88 or higher.
 - 7. Power Factor: 0.98 or higher.
 - 8. Parallel Lamp Circuits: Multiple lamp ballasts shall comply with ANSI C 82.11 and shall be connected to maintain full light output on surviving lamps if one or more lamps fail.
- B. Electronic Programmed-Start Ballasts for T5 and T5HO Lamps: Comply with ANSI C82.11 and the following:
 - 1. Lamp end-of-life detection and shutdown circuit for T5 diameter lamps.
 - 2. Automatic lamp starting after lamp replacement.
 - 3. Sound Rating: A.
 - 4. Total Harmonic Distortion Rating: Less than 20 percent.
 - 5. Transient Voltage Protection: IEEE C62.41, Category A or better.
 - 6. Operating Frequency: 20 kHz or higher.
 - 7. Lamp Current Crest Factor: 1.7 or less.
 - 8. BF: 0.98 or higher, unless otherwise indicated.
 - 9. Power Factor: 0.98 or higher.
- C. Electromagnetic Ballasts: Comply with ANSI C82.1; energy saving, high-power factor, Class P, and having automatic-reset thermal protection.
 - 1. Ballast Manufacturer Certification: Indicated by label.
- D. Single Ballasts for Multiple Lighting Fixtures: Factory-wired with ballast arrangements and bundled extension wiring to suit final installation conditions without modification or rewiring in the field.
- E. Ballasts for Low-Temperature Environments:
 - 1. Temperatures 0 Deg F (Minus 17 Deg C) and Higher: Electronic or Electromagnetic type rated for 0 deg F (minus 17 deg C) starting and operating temperature with indicated lamp types.
 - 2. Temperatures Minus 20 Deg F (Minus 29 Deg C) and Higher: Electromagnetic type designed for use with indicated lamp types.
- F. Ballasts for Low Electromagnetic-Interference Environments: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for consumer equipment.
- G. Ballasts for Dimmer-Controlled Lighting Fixtures: Electronic type.

1. Compatibility: Certified by manufacturer for use with specific dimming control system and lamp type indicated.
 2. Locally dimmed fixtures shall be dimmable to 5% initial light output.
- H. Ballasts for Bi-Level Controlled Lighting Fixtures: Electronic type.
1. Operating Modes: Ballast circuit and leads provide for remote control of the light output of the associated lamp between high- and low-level and off.
 2. Ballast shall provide equal current to each lamp in each operating mode.
 3. Compatibility: Certified by manufacturer for use with specific bi-level control system and lamp type indicated.
- I. Digital Addressable Networked Ballasts – DALI Type
1. Ballast shall be physically interchangeable with standard electromagnetic or standard electronic ballasts, where applicable.
 2. Ballast shall be available in a plastic/metal can or all metal can construction to meet all plenum requirements.
 3. Ballast shall be provided with poke-in wire trap connectors or integral leads color coded per ANSI C82.11.
 4. Performance Requirements
 - a. Ballast shall be Programmed Start.
 - b. Ballast shall be provided with integral protection circuitry to withstand connection of low voltage control leads to mains power supply. In this event, ballast shall default to maximum light output.
 - c. Ballast shall contain auto restart circuitry in order to restart lamps without resetting power.
 - d. Ballast shall operate from 50/60 Hz input source of 120V or 277V with sustained variations of +/- 10% (voltage and frequency) with no damage to the ballast. IntelliVolt models
 - e. Ballast shall be high frequency electronic type and operate lamps at a frequency above 42 kHz to avoid interference with infrared devices and eliminate visible flicker.
 - f. Ballast shall have a Power Factor greater than 0.98 at full light output and greater than 0.90 throughout the dimming range for primary lamp.
 - g. Ballast shall have a minimum ballast factor of 1.00 at maximum light output and 0.03 at minimum light output for primary lamp.
 - h. Ballast shall provide for a Lamp Current Crest Factor of 1.7 or less throughout the dimming range in accordance with lamp manufacturer recommendations.
 - i. Ballast input current shall have Total Harmonic Distortion (THD) of less than 10% when operated at nominal line voltage with primary lamp.
 - j. Ballast shall have a Class A sound rating.
 - k. Ballast shall have a minimum starting temperature of 10C (50F) for primary lamp.
 - l. Ballast shall provide Lamp EOL Protection Circuit for all T5, T5/HO, and CFL lamps.
 - m. Ballast shall control lamp light output from 100% - 3% relative light output for T8 and CFL lamps and 100% - 1% relative light output for T5 / T5HO lamps.
 - n. Ballast shall ignite the lamps at any light output setting without first going to another output setting.
 - o. Ballast shall tolerate sustained open circuit and short circuit output conditions without damage.
 5. Regulatory Requirements

- a. Ballast shall not contain any Polychlorinated Biphenyl (PCB).
 - b. Ballast shall be Underwriters Laboratories (UL) listed, Class P and Type 1 Outdoor; and Canadian Standards Association (CSA) certified where applicable.
 - c. Ballast shall comply with ANSI C62.41 Category A for Transient protection.
 - d. Ballast shall comply with ANSI C82.11 where applicable.
 - e. Ballast shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 18, Non-Consumer (Class A) for EMI/RFI (conducted and radiated).
6. Other
- a. Ballast shall be manufactured in a factory certified to ISO 9002 Quality System Standards.
 - b. Manufacturer shall have a three year history of producing electronic ballasts for the North American market.
 - c. Ballast shall be controlled by a Class 1 or Class 2 low voltage DALI controller.
 - d. Upon loss of normal power and/or DALI control signal, ballast shall default to 100% light output.

2.4 BALLASTS FOR COMPACT FLUORESCENT LAMPS

- A. Description: Electronic programmed rapid-start type, complying with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:
1. Lamp end-of-life detection and shutdown circuit.
 2. Automatic lamp starting after lamp replacement.
 3. Sound Rating: A.
 4. Total Harmonic Distortion Rating: Less than 20 percent.
 5. Transient Voltage Protection: IEEE C62.41, Category A or better.
 6. Operating Frequency: 20 kHz or higher.
 7. Lamp Current Crest Factor: 1.7 or less.
 8. BF: 0.95 or higher, unless otherwise indicated.
 9. Power Factor: 0.98 or higher.
 10. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
 11. Ballast Case Temperature: 75 deg C, maximum.
- B. Ballasts for Dimmer-Controlled Lighting Fixtures: Electronic type.
1. Compatibility: Certified by manufacturer for use with specific dimming control system and lamp type indicated.
 2. Locally dimmed fixtures shall be dimmable to 5% initial light output.

2.5 EMERGENCY FLUORESCENT POWER UNIT

- A. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within lighting fixture body and compatible with ballast. Comply with UL 924.
1. Emergency Connection: Operate one fluorescent lamp(s) continuously at an output of 1100 lumens each. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
 2. Night-Light Connection: Operate one fluorescent lamp continuously.

3. Test Push Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
 - a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 4. Battery: Sealed, maintenance-free, nickel-cadmium type.
 5. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
 6. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and flashing red LED.
- B. External Type: Self-contained, modular, battery-inverter unit, suitable for powering one or more fluorescent lamps, remote mounted from lighting fixture. Comply with UL 924.
1. Emergency Connection: Operate one fluorescent lamp continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
 2. Night-Light Connection: Operate one fluorescent lamp in a remote fixture continuously.
 3. Battery: Sealed, maintenance-free, nickel-cadmium type.
 4. Charger: Fully automatic, solid-state, constant-current type.
 5. Housing: NEMA 250, Type 1 enclosure.
 6. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 7. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 8. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and flashing red LED.

2.6 BALLASTS FOR HID LAMPS

- A. Electromagnetic Ballast for Metal-Halide Lamps: Comply with ANSI C82.4 and UL 1029. Include the following features, unless otherwise indicated:
1. Ballast Circuit: Constant-wattage autotransformer or regulating high-power-factor type.
 2. Minimum Starting Temperature: Minus 22 deg F (Minus 30 deg C) for single-lamp ballasts.
 3. Normal Ambient Operating Temperature: 104 deg F (40 deg C).
 4. Open-circuit operation that will not reduce average life.
 5. Low-Noise Ballasts: Manufacturers' standard epoxy-encapsulated models designed to minimize audible fixture noise.
- B. Electronic Ballast for Metal-Halide Lamps: Include the following features unless otherwise indicated:
1. Lamp end-of-life detection and shutdown circuit.
 2. Sound Rating: A.
 3. Total Harmonic Distortion Rating: Less than 15 percent.
 4. Transient Voltage Protection: IEEE C62.41, Category A or better.
 5. Lamp Current Crest Factor: 1.5 or less.
 6. Power Factor: .90 or higher.

7. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
 8. Protection: Class P thermal cutout.
 9. Retain subparagraph and associated subparagraphs below for bi-level ballasts.
 10. Bi-Level Dimming Ballast: Ballast circuit and leads provide for remote control of the light output of the associated fixture between high- and low-level and off.
 - a. High-Level Operation: 100 percent of rated lamp lumens.
 - b. Compatibility: Certified by ballast manufacturer for use with specific bi-level control system and lamp type indicated. Certified by lamp manufacturer that ballast operating modes are free from negative effect on lamp life and color-rendering capability.
 11. Continuous Dimming Ballast: Dimming range shall be from 100 to 35 percent of rated lamp lumens without flicker.
 - a. Ballast Input Watts: Reduced to a maximum of 50 percent of normal at lowest dimming setting.
 - b. Compatibility: Certified by manufacturer for use with specific dimming control system and lamp type indicated. Certified by lamp manufacturer that ballast operating modes are free from negative effect on lamp life and color-rendering capability.
- C. Auxiliary Instant-On Quartz System: Factory-installed feature automatically switches quartz lamp on when fixture is initially energized and when power outages occur. System automatically turns quartz lamp off when HID lamp reaches approximately 60 percent light output.
- D. High-Pressure Sodium Ballasts: Electromagnetic type, with solid-state igniter/starter. Igniter-starter shall have an average life in pulsing mode of 10,000 hours at an igniter/starter-case temperature of 90 deg C.
1. Instant-Restrike Device: Integral with ballast, or solid-state potted module, factory installed within fixture and compatible with lamps, ballasts, and mogul sockets up to 150 W.
 - a. Restrike Range: 105- to 130-V ac.
 - b. Maximum Voltage: 250-V peak or 150-V ac RMS.
 2. Minimum Starting Temperature: Minus 40 deg F (Minus 40 deg C).
 3. Open-circuit operation shall not reduce average lamp life.

2.7 EXIT SIGNS

- A. Description: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
1. Lamps for AC Operation: LEDs, 70,000 hours minimum rated lamp life.
 2. Must be warranted for at least 20 years.
 3. 8 inch Red letters.
 4. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

- a. Battery: Sealed, maintenance-free, nickel-cadmium type.
- b. Charger: Fully automatic, solid-state type with sealed transfer relay.
- c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
- d. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
- e. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and flashing red LED.
- f. Housing: Die Cast aluminum. Mounting type to be determined based on ceiling conditions – exit sign shall have options for wall, ceiling, and pendant mounting.
- g. Face: Polished extruded acrylic edge lit panel shall have precision etched letters 8" high. Color of letters shall be red with LED sensitive inks. Background color shall be clear.
- h. Direction Arrows: As indicated on drawings.
- i. Mounting: As indicated on drawings.
- j. Input Voltage: 120 volts

2.8 FLUORESCENT LAMPS

- A. Low-Mercury Lamps: Comply with EPA's toxicity characteristic leaching procedure test; shall yield less than 0.2 mg of mercury per liter when tested according to NEMA LL 1.
- B. T5 rapid-start low mercury lamps, CRI 85 (minimum), color temperature 3500 K, and average rated life of 20,000 hours, unless otherwise indicated.
- C. Compact Fluorescent Lamps: 4-Pin, low mercury, CRI 80 (minimum), color temperature 3000 K, average rated life of 10,000 hours at 3 hours operation per start, unless otherwise indicated.
 1. 13 W: T4, double or triple tube, rated 900 initial lumens (minimum).
 2. 26 W: T4, double or triple tube, rated 1800 initial lumens (minimum).
 3. 42 W: T4, triple tube, rated 3200 initial lumens (minimum).
- D. All dimmed fluorescent and compact fluorescent lamps shall be burned in by the Contractor at 100% on for a minimum of 100 hours prior to dimming.

2.9 HID LAMPS

- A. Metal-Halide Lamps: ANSI C78.1372, with a minimum CRI 60, and color temperature 3700K.
- B. Pulse-Start, Metal-Halide Lamps: Minimum CRI 60, and color temperature 3700K.
- C. Ceramic, Pulse-Start, Metal-Halide Lamps: Minimum CRI 80, and color temperature 3000K.

2.10 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

- B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- C. Twin-Stem Hangers: Two, 1/2-inch (13-mm) steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm), with hang-straight mechanism.
- E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage (2.68 mm), with hang-straight mechanism.
- F. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.
- G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

2.11 RETROFIT KITS FOR FLUORESCENT LIGHTING FIXTURES

- A. Comply with UL 1598 listing requirements.
 - 1. Reflector Kit: UL 1598, Type I. Suitable for two- to four-lamp, surface-mounted or recessed lighting fixtures by improving reflectivity of fixture surfaces.
 - 2. Ballast and Lamp Change Kit: UL 1598, Type II. Suitable for changing existing ballast, lamps, and sockets.

2.12 REQUIREMENTS FOR INDIVIDUAL LIGHTING FIXTURES

- A. Refer to Light Fixture Specification sheets at the end of this section with manufacturer's information and additional notes.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Support for Lighting Fixtures in or on Grid-Type Suspended Ceilings: Use grid as a support element.
 - 1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches (150 mm) from lighting fixture corners.
 - 2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
 - 3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.
 - 4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.
- C. Air-Handling Lighting Fixtures: Install with dampers closed and ready for adjustment.

- D. Adjust aimable lighting fixtures under supervision of Commissioner as designated by Commissioner. Contractor shall coordinate meeting time for aiming at night with Commissioner and a work crew as determined necessary by Commissioner. All required equipment shall be available for aiming, including ladders or other lift equipment, and lamps and accessories as specified.

3.2 FIELD QUALITY CONTROL

- A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.
- B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 265100

SECTION 26 61 11 - PERFORMANCE DIMMING AND CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This section includes dimming and control systems for performance lighting, concert lighting, work lighting, and house lighting in the following areas:

- 1. Theatre 1
 - a. Lighting Control Console
 - b. Portable dimmer sticks
- 2. Theatre 2
 - a. Lighting Control Console
 - b. Portable dimmer sticks

- B. The extent of performance lighting, dimming, and control is indicated by drawings and schedules.

- C. Section Includes:

- 1. Materials, components, modifications, assemblies, equipment and services as specified herein. These include, but are not limited to:
 - a. Verification of site dimensions and conditions
 - b. Submittals as required by the Contract Documents
 - c. Engineering of equipment and systems as required by the Contract Documents
 - d. Manufacture of equipment and systems as required by the Contract Documents
 - e. Scheduling, sequencing and coordination with other trades
 - f. Installation and supervision for equipment and systems specified herein and elsewhere in the Contract Documents
 - g. Testing and demonstration of equipment and systems as specified herein and elsewhere in the Contract Documents
- 2. Portable Dimmer Sticks
- 3. Electronics Racks
- 4. Control Consoles and Accessories
- 5. House/Work Light Control Systems
- 6. DMX Driven Relay Panels
- 7. Data Communications Devices
- 8. Performance Lighting Distribution and Control Faceplates

- D. Related Sections:

- 1. Division 1: General and Supplementary Requirements with special attention to the following:

- a. Division 11: Equipment
- b. Division 26: Electrical

1.3 MANUFACTURER QUALIFICATIONS

- A. Manufacturer shall be one who has been continuously engaged in the production of theatrical lighting and control equipment for at least three years and in the manufacture Theatrical Dimming systems and dimmers for three years.
- B. Manufacturer shall provide a twenty four (24) hour emergency service phone line. A field service engineer shall respond to an emergency call on this line within thirty (30) minutes.

1.4 REFERENCES

- A. National Fire Protection Association (NFPA) Publication: National Electrical Code, NFPA70
- B. Underwriters' Laboratories, Inc. (UL) Standards:
 - 1. UL498, Electrical Attachment Plugs and Receptacles
 - 2. UL508, Electrical Industrial Control Equipment
 - 3. UL891, Dead-front Electrical Switchboards
 - 4. UL1573, Stage and Studio Lighting Units
- C. ANSI E1.20 – 2006 Entertainment Technology--Remote Device Management over USITT DMX512
- D. ANSI E1.24 – 2006 Entertainment Technology--Dimensional Requirements for Stage Pin Connectors
- E. ANSI E1.17 – 2006 Entertainment Technology - Architecture for Control Networks
- F. Institute of Electrical and Electronics Engineers, Inc.:
 - 1. Standard: 802.3
 - 2. Standard: 802.11 b or g

1.5 SUBMITTALS

- A. All submittals shall be in accordance with General and Special Conditions. All submittals shall be submitted in a timely manner, allowing sufficient time for adequate review and possible re-submittal without jeopardizing the project schedule.
- B. Shop Drawings:
 - 1. Shop drawings shall be submitted within ninety (90) days of award of contract, unless otherwise indicated in DDC General Conditions.
 - 2. Drawings for fabrication and installation of all products; Drawings will show all information necessary to explain fully the design features, appearance, function, fabrication, installation and use of system components in all phases of operation.
 - 3. Fabrication, Installation, and Erection shall not commence until shop drawings have been approved by the Commissioner and the Theatre Consultant.
 - 4. Submittal will be drawn in an 11"x17" format.
 - 5. All sheets in the submittal shall be of the same size.
 - 6. Submittal shall include a title sheet listing all sheets in the submittal.

7. Submittal shall include a complete bill of materials showing all items being supplied by the manufacturer and or supplier.

C. Commissioning Documentation:

1. Certificates from the manufacturer's field engineer stating the installed system is operating properly and complies with manufacturer's recommendations
2. Schedule of all tested and certified Ethernet cable run lengths

D. Record Drawings and Maintenance Manuals:

1. Operations and Maintenance Manuals shall include:
 - a. Contact information for pertinent manufacturers
 - b. Safety and Operational Instructions
 - c. Complete parts and subassembly list
 - d. Software version information
 - e. Wiring diagrams and termination schedules
 - f. Periodic Maintenance Schedule
 - g. A maintenance procedure for finishes
 - h. Certificates of compliance with applicable codes
 - i. Records of final testing and log
 - j. Spare parts list and source information
 - k. Provide the above in Universal electronic format files; pdf file type is preferred, as full size printable sheets. Submit files on standard pc format CD clearly labeled including project name, project commissioner, theatre consultant, contractor name, date of submittal.
2. Include diagrams depicting the system layout and interconnections. Reduced size, 11X17 preferred, hardcopy prints.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver equipment and controls securely wrapped in factory fabricated wooden or fiberboard containers.
- B. Handle equipment and controls carefully to prevent breakage, denting and scoring finish. Do not install damaged equipment and controls; replace and return damaged units to equipment manufacturer.
- C. Storage and Protection: All equipment shall be stored in a secure, environmentally controlled location. No equipment shall be placed until that location is substantially completed, free from construction dust and "broom clean". Store in original cartons and protect from dirt, physical damage, weather, and construction traffic.
- D. Acceptance at Site: Contractor shall accept and inventory all equipment upon delivery and provide copies of the inventory to the commissioner.

1.7 PROJECT/SITE CONDITIONS

- A. Field Measurements: Contractor is to verify all dimensions as they relate to requirements of the specification and manufacturer's requirements, and is to notify the City of New York's Representative of any variations, which would affect the installation and safe operation of the systems.

1.8 WARRANTY

- A. Special Warranty: The manufacturer of the stage lighting and control equipment shall warranty the Electrical Distribution, Dimming and Control equipment to be free from defects of material or workmanship for a period of two (2) years from the date of acceptance. During the period of this warranty, equipment, which proves to be defective, shall be repaired or replaced within thirty (30) days at no charge to the City of New York. Unauthorized local repairs of the equipment during the warranty period shall relieve the manufacturer of its responsibilities under this warranty.

1.9 WARRANTY SERVICE

- A. Extra Materials:
1. Provide one of each type of control electronics module.
 2. Provide one spare module for each type of power module provided.
- B. Warranty Service: Provide warranty service for a period of one (1) year after final acceptance of the installation. This service shall cover parts and labor. This service consists of at least two (2) half-yearly visits to the site for checking and adjusting of equipment. Perform the first visit six (6) months after the system has been accepted.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide the dimming systems from components (except where otherwise stated) that are the products of one of the following manufacturers:
1. Strand Lighting, Inc., Cypress, CA or approved equal.

2.2 MANUFACTURED UNITS

- A. Portable Dimmer Stick:
1. General:
 - a. Portable dimmer stick shall be fully digital including modular dimming modules as well as performance networking and DMX communication components.
 - b. Dimming modules shall have the capability to switch internally between forward and reverse phase dimming.
 - c. Dimmer stick exteriors shall be finished with scratch-resistant black powder coat paint. Interior surface finishes shall be corrosion resistant.
 - d. Finished dimensions shall be nominally six (6) inches high by four (4) inches deep by seventy-two (72) inches long. The dimmer stick shall not weigh more than 40 pounds.
 - e. Provide a minimum of two (2) hanger styles including a pipe mounting bracket with cheeseborough style clamp as well as a modified pipe mounting bracket with cheeseborough style clamp that can support a single piece of schedule 40 pipe to mount underneath utilizing a properly rated U-bolt.
 - f. Dimmer stick shall be able to accept 208V 3Ø electrical input. Input cable shall be 8'-0" with appropriately rated NEMA twistlock connector.
 - g. Each dimmer channel shall have power efficiency greater than 97% at full load with a maximum voltage drop of 2.5 volts.

- h. Unit shall be factory pre-wired and dressed with all internal wiring accessible via a removable front cover panel. Processing and network module shall be accessible at all times.
 - i. Dimmer stick and dimmer modules shall be manufactured to allow for interchange of modules to fit user requirements. A total of three (3) interchangeable power modules plus the processing module shall be utilized within the dimmer stick.
2. Processing Module
- a. Dimmer stick shall include a processor module with six push buttons and an LCD display. The following functions shall be capable of being set at the unit:
 - 1) DMX address – display and update DMX512 start address including universe
 - 2) System Status – number of dimmers, module status, firmware version
 - 3) Module Status – module operational level, temperature, voltage, connected load, and dimmer status
 - 4) Dimmer Options – adjust modes (reverse, forward, non-dim, LED), output voltage, dimmer curves
 - 5) General Configuration – LCD backlight settings, processor password
 - b. Provide the following control and communication ports as standard:
 - 1) (1) Optically isolated DMX512 and feed thru
3. Dimmer Modules
- a. Dimmer modules shall utilize Insulated Gate Bipolar Transistors (IGBT) to control load voltage. Dimmers shall not use filter chokes to control the rate of rise in the load current waveform.
 - b. A single dimmer module shall contain two dimmers rated for 2.4kW. The module shall be capable of splitting a total of 2.4kW across the two dimmers in any combination as long as total module load does 2.4kW.
 - c. Output short-circuits between load and neutral or load and group shall not cause damage to the dimmers.
 - d. Insertion loss shall be less than three volts RMS with minimal variance between full and reduced dimmer loading.
 - e. Modules shall automatically switch between Reverse and Forward Phase Control when inductive loads are detected.
 - f. Dimmers shall comply with industry standard Square Law dimming curve. Incandescent loads shall be within a tolerance of +/- 0.5 volts RMS.
 - g. Dimmers shall be capable of detecting operating conditions and protect itself and the load under different conditions. Protective measures shall include feedback to the LCD Display as well as RDM or other industry standard protocol for bi-direction communication. In the event of extreme conditions, the dimmers shall shut down automatically.
4. Provide signage on the back of the dimmer stick with the following attributes:
- a. Material: 1/8" black lamacoid.
 - b. Finish: black with white fill.
 - c. Engraving: 3/8" high characters with non-yellowing white fill.
 - d. Indicate the following on the sign:

Project:	Project Name
Theatre Consultant:	
Manufacturer:	Company Name city, state and service telephone number.

5. Provide total of (15) dimmer sticks per theatre.
6. Acceptable Products:
 - a. Strand S21 Dimmer Stick
 - b. Any alternates submitted must meet the above criteria as well as meet project acoustic requirements.
 - 1) Physical samples are required for acoustic testing and must come complete with 120V 20A NEMA rated connector.
 - 2) Contractor is responsible for all shipping costs and may be billed at the specifier's hourly rates.
 - 3) Submitted units will be returned in (10) working days.

2.3 CONTROL CONSOLES

A. General:

1. Provide software current at time of installation.
2. Software Features:
 - a. Capacity to display the following screens
 - b. Live Mode - Levels currently active on stage
 - c. Blind Mode - Levels recorded in a preset
 - d. Patch Display - Patching information
 - e. Setup configuration - Basic operating parameters
 - f. Default Fade Time
 - g. Dimmer configuration
 - h. Channel configuration
 - i. Hardware configuration
 - j. Print Functions:
 - 1) Stage Display
 - 2) Cues
 - 3) Submasters
 - 4) Patch
 - k. Patching:
 - 1) Proportional patching of dimmers to channels of control
 - l. Recording
 - m. Channel list
 - n. Proportional adjustment of current channel list with level wheel
 - o. Setting of levels with AT function
 - p. Release of channel list without modification
 - q. Recording of stage or blind settings
 - r. Cue numbers between 000.1 to 999.9
 - s. Non-sequential recording
 - t. Cue time fades of 1 to 99 seconds
 - u. Split fade up and down times

- v. Cue linking allowing cues to automatically follow each other
 - w. Link delay time
3. Playback:
- a. Pairs simultaneously timed cross fades, pile-on fades, and split fades
 - b. Last action within each fader pair
 - c. Highest level between fader pairs
 - d. Capacity to override, halt, or release halted fades
 - e. Discrete overriding of each half of a fader pair
4. Submasters:
- a. Submasters are overlapping in a highest takes precedence fashion.
 - b. Each submaster has a bump button which forces channels assigned to that submaster to their recorded level.
 - c. Submasters are recorded live or blind.
 - d. Proportional control of assigned levels
 - e. Capacity to build cues from submasters
5. Effects package including:
- a. Effects built from submasters
 - b. Variable one (1) to six (6) part chase
 - c. Level and rate control of chase
6. Consoles shall directly support third-party streaming ACN devices
7. On-line help information
- B. 400 Channel Performance Lighting Console:
1. Minimum Basic Capacities:
- a. One thousand five hundred thirty-six (1536) dimmer capacity
 - b. Four hundred (400) control channels
 - c. Six hundred (600) cue memory capacity
 - d. Twenty-four by ten (24x10) submasters
2. Hardware Features:
3. Two (2) black 17" local LCD displays
- a. One (1) parallel printer port
 - b. One (1) remote focus port
 - c. One (1) Ethernet port for remote video and Designer's remote
 - d. Operating software stored in upgradeable, internal non-volatile memory
 - e. Show data storage in battery backed up random access memory
 - f. Extended numeric keypad for entering dimmer, channel, submaster, preset, level, time and link instructions
 - g. Display keypad to provide access to display settings
 - h. One alpha-numeric keyboard for notating cue information
 - i. Level wheel for proportional intensity control over user selectable channels
 - j. Two (2) electronically timed cross faders with manual override, each with a fade time status display, HOLD, CLEAR, GO BACK and GO functions
 - k. Proportional Grand master

2. Radio Remote Focus Unit:
 - a. Provide portable unit capable of calling up dimmers, channels, cues and submasters.
 - b. Provide each unit with one (1) 25' control cable and one (1) 50' extension cable.
 - c. Provide Radio Receiver to support portable unit.
 - d. Provide spare battery and charger for each handheld portable.

E. Console Desk:

1. Provide one (1) monitor arm for each local console monitor. Monitor arm shall be designed to allow the easy repositioning of the monitors above the console.

F. Dust Covers:

1. Provide for each console and each video display.

G. Power filtration / line regulation / battery backup with the following minimum capacities:

1. Input voltage < 132 V AC
2. Output voltage 115 V AC \pm 5%
3. Transfer voltage 103 V AC
4. Surge energy 240 J
5. Surge current 6500 A peak
6. Surge response time 0 ns (instantaneous)
7. Noise filtration, full time EMI / RFI suppression, 100 kHz to 10 MHz, > 60 dB
8. Audible low battery signal
9. Minimum of 10 minutes back-up time

2.4 HOUSE/WORK LIGHT SYSTEM

A. General:

1. Provide an integrated House/Work Light Control system. The system is capable of controlling performance, and house lighting dimmers and work lighting relays through local and master control stations.
2. System controls dimmers over DMX-512 data communications protocol.
3. House/Work Light Controls and Control Console have simultaneous "pile on" control of dimmers and relays as shown on the Drawings.
4. System is programmable using a personal computer or designated LCD touchscreen control stations.
5. User interface is through pushbutton and or LCD touchscreen control stations.

B. Standard Operating Features:

1. Control system allows cross fading between presets within each of multiple rooms.
2. Presets can mirror between stations.
3. System parameters are user configurable. These parameters include but are not limited to current date, current time, dimmer type, high level limit, control station name, preset names, presets, mirror designation, lockout modes, dimmer assignments per channel, preset master names, station numbers, channel levels, and station names.
4. System accepts dry closures from external sources. Closures shall be momentary alternate action turning channels or presets on or off.
5. Fade times on each preset are adjustable from 0 - 999 seconds.
6. Preset masters are available to control groups of presets throughout the system.

7. Preset masters shall also provide "template" ability whereby station activation or control parameters maybe changed.
8. System provides disk storage of configuration and lighting data.
9. Provide Architectural lighting program to City of New York for future changes to system configuration.

C. Pushbutton Stations:

1. Provide Pushbutton Stations with the following minimum capabilities and equipment:
 - a. Each Pushbutton may be configured to control a single channel or a single preset as required.
 - b. Each Pushbutton may be configured either to toggle a preset or channel on and off or to initiate a crossfade to another preset as required.
 - c. Faceplate signage is screened as per Contract Documents. Each pushbutton station may be configured to control multiple channels or presets as required by the different states for which the system is configured.
 - d. Station shall fit into a standard single gang wall box for recessed installation.
 - e. Provide painted steel backbox sized to faceplate dimensions for surface installation.
 - f. Provide LED indicators programmable as locator lights, station active pilot lights, or station enabled pilot lights.
 - g. All pushbutton stations shall be Power-over-Ethernet, dual speed units capable of operating standard and fast Ethernet protocols

D. LCD Touchscreen Stations:

1. All LCD touchscreens should be 7" Active Matrix type screens or larger.
2. LCD touchscreens shall be custom configured to project requirements.
3. Station shall provide up to 128 presets.
4. Station shall be able to address individual dimmers and relays within a preset and modify levels and fade times.
5. Multiple LCD touchscreen control stations shall mimic and control shall be last action takes precedence.
6. Provide programming, patching and recording ability from Lighting Control Room stations.
7. Provide LCD Screen graphics and functionality as shown on the contract drawings.
8. Provide painted steel backbox appropriately sized for recessed installation.
9. Provide painted steel backbox sized to faceplate dimensions for surface installation.
10. Provide lockable cover as shown on faceplate drawings.
11. All LCD touchscreens shall be Power-over-Ethernet, dual speed units capable of operating standard and fast Ethernet protocols.
12. Provide a total of three (3) for Theatre 1 and two (2) for Theatre 2.

E. Station Material and Finish:

1. Material: 1/8" aluminum.
2. Finish shall be "Black" or "Custom" as indicated on the drawings.
 - a. Black finish: 120 grit, horizontally brushed black anodized.
 - b. Special finish: Powder coat painted finish.
 - c. Legends: Engraved and paint filled as shown or as directed.
 - d. Reinforce faceplate as needed to minimize deflection.

- F. The system shall be configured to provide no delay time between the toggle "on" position and the illumination of the lighting fixture and the reporting back to the station.
- G. Acceptable Product:
 - 1. Paradigm System, Electronic Theatre Controls
 - 2. Vision.net System, Strand Lighting
- H. DMX to DALI Converter
 - 1. House light fixtures will incorporate dimming ballasts and be DALI controlled.
 - 2. The house light system shall incorporate a DMX to DALI converter capable of addressing each house light fixture separately.
 - 3. Broadcast Control shall not be permitted.
 - 4. DMX channels 1-200 shall be used for DALI fixtures 1-200.
 - 5. Converter shall communicate with architectural lighting processor via DMX and appear to the processor as a house light dimmer rack.
 - 6. Acceptable Products:
 - a. Doug Fleenor DMX to DALI converter

2.5 DATA COMMUNICATIONS

- A. Provide a fully functioning Performance lighting Ethernet and distributed DMX system. The system shall be installed in conformance with ANSI E1.11 – 2008, ANSI E1.17 - 2010 and IEEE 802.3 standards and the control console manufacturer's requirements.
- B. Coordinate the wireless Ethernet protocols with other areas of theatrical production (Sound, Rigging and Automation, and Administration) to ensure that the theatrical lighting system has its own dedicated secured channel and doesn't broadcast SSID information that would allow the system to be compromised. Set up MAC address filtering if nearby networks require it.
- C. Provide network diagnostic tools (software) to enable users to view network activity and diagnose data problems.
- D. Ethernet Switches/Patch Panels:
 - 1. Provide switches and patch panels of a high quality from a company with (3) three or more years of experience manufacturing this equipment.
 - 2. All Enet switches shall be Power-over-Ethernet, dual speed units capable of operating standard and fast Ethernet protocols.
 - 3. Label switches and patch panels with the locations of the field boxes and as labeled in the box schedules.
 - 4. Provide proper quantity of Category 5e patch cables to patch all field devices to hubs/switches.
 - 5. All wireless switches must comply with latest IEEE 802.3 b/g standards and are to be installed using best industry practices.
 - 6. Provide web browsable switches that can be accessed through any commercially available web browser.
 - 7. Provide rack mounted power filtration / line regulation / battery backup unit (as specified herein) for each hub/switch.
 - 8. Provide a total of two (2).
 - 9. Acceptable products:
 - a. Cisco Systems – 170 West Tasman Drive San Jose, CA

- b. Netgear – 4500 Great America Parkway, Santa Clara, CA 95054

E. Ethernet Nodes:

1. Provide the latest products available from the control console manufacturer at the time of installation.
2. Provide rack mounted full-feature node in each aux rack for DMX connection to dimmers.
3. Provide a quantity of five (5) two port portable Ethernet nodes for Theatre 1 and a quantity of four (4) two port portable Ethernet nodes for Theatre 1. The enclosures for the 2 port nodes must fit in a deep 2 gang box for future permanent mounting.
4. Provide portable Ethernet nodes with C-clamp and power cable.
5. Control cables shall be constructed from proplex cables using ethercon connectors.
6. Provide four (6) 25' Ethernet control cables.
7. Provide four (4) 25' DMX control cables.
8. Provide two (2) 6' Male-to-Male DMX control cables.
9. Acceptable products:
 - a. ETC – Net3 Touring Gateway
 - b. Strand Lighting – N21 ShowNet Node

2.6 DISTRIBUTION AND CONTROL FACEPLATES AND BACKBOXES

A. General:

1. For surface mounted conditions faceplate and back box dimensions are equal.
2. Remove sharp edges and burrs on faceplates.
3. In all cases faceplate screw color is to match faceplate color.

B. Distribution (Line Voltage) Faceplates:

1. Material: Minimum 16-gauge steel.
2. Finish shall be "Black" or "Custom" as indicated on the drawings.
 - a. Black finish: Powder coat flat black enamel.
 - b. Special finish: Powder coat painted finish to match Commissioner's sample.
3. Provide terminal strips as needed for connection of wiring within pigtail boxes.
4. Reinforce faceplates as needed where deflection may occur under heavy use.
5. Label each faceplate with circuit numbers as shown on the Drawings and Schedules.
 - a. Material: 1/8" black lamacoid.
 - b. Finish: Black with non-yellowing white fill.
 - c. Engraving: 1/2" high characters with non-yellowing white fill.
6. Apply labels with appropriate adhesive and rivet to faceplates.
7. Label faceplates for duplicate circuits as follows:
 - a. Material: 1/8" OSHA safety yellow lamacoid.
 - b. Finish: OSHA safety yellow with black fill.
 - c. Engraving: 1/2" high characters with black fill.
8. Labels for concert circuits shall be:
 - a. Material: 1/8" red lamacoid.
 - b. Finish: Red with non-yellowing white fill.

- c. Engraving: 1/2" high characters with non-yellowing white fill.
- 9. Label the inside back of each box with an arrow indicating the "up" position.
- 10. Label the outside top of each box with a removable OSHA yellow sticker with a minimum of 1" high lettering indicating the "up" position.
- 11. Fill any and all unused pre-drilled mounting holes.
- 12. Label each pigtail connector with circuit number, unless otherwise indicated.
 - a. Directly engrave into cover of connector in 1/2" high characters with non-yellowing white fill.
- 13. Flexible Cable:
 - a. Type SO sized to accommodate the maximum load of the terminating connector
 - b. Black in color
- C. Control Faceplates:
 - 1. Material: 1/8" aluminum.
 - 2. Finish shall be "Black" or "Custom" as indicated on the drawings.
 - a. Black finish: 120 grit, horizontally brushed black anodized.
 - b. Special finish: Powder coat painted finish to match Commissioner's sample.
 - 3. Reinforce faceplate as needed to minimize deflection.
 - 4. Legends: Engraved and paint filled as shown or as directed.
 - 5. Faceplate shall fit into standard sized gang wall box for recessed installation.
 - 6. Provide painted steel backbox sized to faceplate dimensions for surface installation.
 - 7. Control faceplates shall accept ethercon connectors.
- D. Acceptable Manufacturers:
 - 1. Lex Products
 - 2. TMB
 - 3. Electronic Theatre Controls
 - 4. Strand Lighting

2.7 DMX DRIVEN RELAY PANELS

- A. Control Features:
 - 1. Standard control format is DMX-512.
 - 2. Contains diagnostics
 - 3. Hold relay positions in the event of a control interruption.
- B. Relays: Provide power connections via screw terminals. Quantities as per electrical drawings.
- C. Acceptable Products:
 - 1. Control Relay Panel – Strand Lighting
 - 2. Smartswitch Relay Cabinet – Electronic Theatre Controls
- D. Accessories
 - 1. Provide Two (2) Copies of Associated Manuals.

2. Configuration Documentation:
 - a. Provide Two (2) Copies of Each System Configuration on compact disk. (Lighting Console, Nodes, Dimmers).
 - b. Provide one (1) Printed copy of the system configuration.

E. Supplementary

1. Provide equipment and hardware in addition to the items specified previously that are necessary to provide a fully working system in conformance with the intent of the Contract Documents.

2.8 EQUIPMENT RACK

- A. Provide two (2) rolling equipment racks, one (1) for Theatre 1 and one (1) for Theatre 2, in order to mount control system equipment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where performance dimming and controls are to be installed and to verify that conditions are satisfactory for installation and comply with manufacturer's requirements and those specified in this section.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install performance lighting and controls where shown, in accordance with manufacturer's written instructions and with recognized industry practice to ensure that performance lighting equipment complies with applicable requirements of NEC and UL standards and with the applicable portions of NECA's "Standard of Installation".
- B. All load circuit conductors shall be continuous from the dimmer room to the back box without splices or connectors.
- C. All data wiring shall be continuous from termination point to termination point. No splices or connectors allowed.

3.3 FIELD QUALITY CONTROL

- A. Provide or facilitate the following tests or inspections. Correct deficiencies and retest deficient items.
- B. Visual and Mechanical Inspections: Include the following:
 1. Inspect each outlet, dimmer and other loose items of equipment for defects, finish failure, corrosion, physical damage, labeling, and nameplate.
 2. Exercise and perform operational tests on mechanical parts and operable devices according to manufacturer's instructions or routine functional operation.
 3. Check tightness of electrical connections with torque wrench calibrated within the previous six (6) months. Use manufacturer's recommended torque values.
 4. Verify proper protective device setting and fuse types and ratings.

- C. Electrical Tests: Perform according to manufacturer's instructions. Exercise caution testing devices containing solid state components.
1. Operational and continuity tests of dimming circuits. Perform an outlet by outlet operational test of the dimming circuits to determine proper wiring and exact correspondence between the dimmer numbers and the outlet labels.
 2. Operational tests of Ethernet runs: Test each Ethernet wiring run for proper operation in conformance with the IEEE standard. Document the length of each run.
- D. Manufacturer's Field Service:
1. Provide the services of a qualified service representative, employed regularly and full time by the manufacturer of the control system(s), to check the installation of the control system(s) and ensure its proper operation. Do not energize any part of the control system until their check is complete and the service representative is present to observe the turn-on procedure.
 2. Provide manufacturer's technician to configure house/work lighting control system as directed prior to system commissioning. One (1) set of changes to the initial operating configuration may be required subsequent to commissioning. One (1) set of changes will be required following acceptance.
- E. System Commissioning:
1. Upon completing installation, other tests, and manufacturer's check-out, schedule an inspection and operating test with the Commissioner and Theatre Consultant. Facilitate such tests as may be required to ensure that all equipment is in compliance with the intent of the specification.
 2. Comply with the following conditions required for commissioning:
 - a. Provide documentation to Theatre Consultant certifying all Ethernet outlets adhere to IEEE standards.
 - b. All handover and loose equipment provided under this section to be on site and available for testing.
 - c. All architectural lighting fixtures wired to the dimming system to be installed and lamped.
 - d. Provide full and uninterrupted access to stage, auditorium, and technical areas required for commissioning tests. Blackouts of lighting will be required.
 - e. Contractor's project representative to be present during tests as required.
 - f. Provide Manufacturer technicians for final programming of all systems.
 - g. Manufacturer's factory field technician to be present during tests and inspections.
 - h. Provide personnel to operate equipment and perform adjustments as necessary.
 - i. Provide access equipment as required.
 3. Contractor is required to facilitate the Consultant/Commissioner commissioning of the Dimming and Control system. This commissioning will include but is not limited to the following items.
 - a. Verify that loose and installed equipment quantities are as contracted.
 - b. Inspect all system components individually for conformance to specification.
 - c. Test each branch circuit for operation, correct circuit identification, and proper arrangement of hot, neutral, and ground conductors.
 - d. Spot test selected branch circuits at maximum load.
 - e. Verify operation of all worklight and houselighting fixtures. Test operation of all worklight and houselight control devices. Verify that logical operation of controls is as specified.

- f. Verify operation of all portable control and portable display devices from all associated receptacle locations.
- g. Using a DMX source, verify operation of DMX distribution network.
- h. Confirm the proper operation of the lighting Ethernet system.
- i. Review operation, maintenance, and instruction manuals. Review warranty certificate.
- j. Confirm that user training has/will occur per specification.

3.4 ADJUSTING AND CLEANING

- A. Remove paint spatters and other spots, dirt, and debris. Repair scratches and mars of finish to match original finish. Clean devices and equipment internally and externally using methods and materials as recommended by manufacturers.

3.5 DEMONSTRATION AND INSTRUCTION

- A. The manufacturer of the dimming system shall provide a minimum of eight (8) hours of training in the operation of the control console, architectural control system and other related systems specified herein. These sessions shall consist of two (2) – four (4) hour sessions at times separate from the check out of the systems. Training time to be arranged with the staff of the facility and shall take place over the first two (2) months after building acceptance. These training sessions cannot be completed consecutively and should be separated by no less than 1 month or as directed by users.

3.6 EQUIPMENT LIST

- A. Provide pricing broken down in packages as shown below.

THEATRE 1

<u>Qty.</u>	<u>Equipment</u>	<u>Basis of Design Manufacturer</u>	<u>Basis of Design Model</u>	<u>Notes</u>
15	Distributed Dimming Stick - (6) 1.2kW IGBT	Strand	S21	
1	Houselight Control System	ETC Strand	Paradigm Vision Net	
32	Performance Control Faceplates			
4	Single button station	Match control system		
1	4 fader 7 button station	Match control system		
4	7 fader 7 button station	Match control system		
3	LCD station	Match control system		
1	Work Control Faceplates	Match control system		lot
4	2 port DMX Nodes	ETC Strand	Net3 N21 Shownet	
5	DMX Node distribution	Pathway	Pathport Octo	
1	ENET Switch	Cisco or Netgear		
1	DMX to DALI Processor	Doug Fleenor		
1	UPS	ETC	PJPS1012	
1	DMX Controlled relay cabinet	Strand ETC	Control Relay Smartswitch	

1	Rolling equipment Rack	SKB	Roto GigRig	
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LIGHTING CONTROL CONSOLE				
Qty	Equipment	Basis of Design Manufacturer	Basis of Design Make	Notes
1	Control console - 500 channels	ETC Strand	ION 1000 Light Pallet Classic	
1	Fader wing	Match console		2 x 20
1	Control console - 500 channels	ETC Strand	Element 40 Pallet VL	
4	Flat panel LCD monitors			17"
1	Console stand			
1	Handheld remote control - Wireless	Match console		

THEATRE 2

Qty.	Equipment	Basis of Design Manufacturer	Basis of Design Model	Notes
15	Distributed Dimming Stick - (6) 1.2kW IGBT	Strand	S21	
1	Houselight Control System	ETC Strand	Paradigm Vision Net	
21	Performance Control Faceplates			
4	Single button station	Match control system		
1	4 fader 7 button station	Match control system		
2	LCD station	Match control system		
1	Work Control Faceplates	Match control system		Lot
4	2 port DMX Nodes	ETC Strand	Net3 N21 Shownet	
4	DMX Node distribution	Pathway	Pathport Octo	
1	ENET Switch	Cisco or Netgear		
1	DMX to DALI Processor	Doug Fleenor		
1	UPS	ETC	PJPS1012	
1	DMX Controlled relay cabinet	Strand ETC	Control Relay Smartswitch	
1	Rolling equipment Rack	SKB	Roto GigRig	

LIGHTING CONTROL CONSOLE				
Qty	Equipment	Basis of Design Manufacturer	Basis of Design Make	Notes

1	Control console - 500 channels	ETC	Element	
2	Flat panel LCD monitors			17"
1	Console stand			
1	Handheld remote control - Wireless	Match console		

END OF SECTION 26 61 11

SECTION 27 05 00 - COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section covers general work of all Sections under Division 27. Drawings and general provisions of the Contract, including General and supplemental Conditions and DDC General Conditions sections, apply to this section.
- B. The Contractor shall comply with all requirements mandated under the NY State General Services contracts for Signal Wiring and Cabling. The Contractor will comply with all applicable governmental regulations and with all local ordinances.
- C. The work covered by this Section consists of furnishing all materials, accessories, connectors, supports, electrical protection, equipment, tools, setup, preparation, labor, supervision, incidentals, transportation, storage and related items and appurtenances, and performing all operations necessary to complete the telecommunications work as indicated in the project drawings and specified herein. Completely install, connect, and test all systems, equipment, devices, etc. shown or noted or required to final connections and leave ready for satisfactory operation. Provide any minor items omitted from the design, but obviously necessary to accomplish the above intent.
- D. Any item not specifically shown on the drawings or called for in the specifications, but normally required to conform to the intent, are to be considered as part of the Contract.
- E. Section Includes:
 - 1. Sleeves for pathways and cables.
 - 2. Sleeve seals.
 - 3. Grout.
 - 4. Common communications installation requirements.

1.2 QUALITY ASSURANCE

- A. All products shall be installed new, best of their respective kinds, free from defects, listed by Underwriter's Laboratories for the intended use, and bearing their label.
- B. Any given item of equipment or material shall be the product of one manufacturer throughout the facility. Multiple manufacturers of any one item will not be permitted, unless specifically noted otherwise.
- C. Obtain from the manufacturers detailed instructions for installation of that manufacturers' products.
- D. Ensure that all components meet all regulatory requirements for the respective component being used.
- E. All products, services and materials provided and performed under the scope of this Specification shall conform to the manufacturer's requirements.

- F. Contractor is solely responsible for quality control of the Work and must comply with the Quality Control requirements specified herein.
- G. All materials shall be new and unused and free from defects. All materials shall meet all applicable codes provided a standard has been established for the material in question.
- H. All products and materials to be clean, free of defects, and free of damage and corrosion.
- I. Installation Qualifications:
 - 1. In order to provide proper coordination, uniform quality and system integrity, the equipment and installation specified within this Specification shall be provided and installed by a single contractor with a proven track record in the field of the specified system. Personnel shall be competent and qualified by experience and training for the installation.

1.3 CODES, REGULATIONS AND STANDARDS

- A. The installation shall comply fully with all government authorities, laws and ordinances, regulations and codes applicable to the installation
- B. Should any change in plans or specifications be required to comply with governmental regulations, the Contractor shall notify the Commissioner at the time of submitting the Shop Drawings.
- C. Local electrical and building codes may differ with national codes. Follow the most stringent code or recommendations. Where there are instances of ambiguity refer to the Commissioner for interpretation.
- D. All equipment shall be equal to or exceed the minimum requirements of NEMA, IEEE, ISO, ASME, NEC, ANSI and Underwriters' Laboratories.
- E. Comply with the following Standards and Codes:
 - 1. Building Industry Consulting Service International (BICSI) Telecommunications Distribution Methods Manual, current edition.
 - 2. American National Standards Institute / Telecommunications Industry Association (ANSI/TIA)
 - a. ANSI/TIA -568-C.1 Commercial Building Telecommunications Cabling Standard
 - b. TIA/EIA-569 Commercial Building Standard for Telecommunications Pathways and Spaces
 - c. TIA/EIA-606 Administration Standard for Commercial Telecommunications Infrastructure
 - d. J-STD-607-B Telecommunications Grounding and Bonding for Customer Premises
 - 3. Federal Communications Commission Title 47
 - a. FCC Part 15
 - b. FCC Part 68

4. Institute of Electrical and Electronic Engineers IEEE 802.3
5. NEMA VE 1 Metallic Cable Tray Systems
6. ISO/IEC 11801 International Organization for Standardization
7. National Electrical Manufacturers Association (NEMA)
8. National Electrical Safety Code (NESC)
9. National Fire Protection Association (NFPA)
 - a. NFPA 70 National Electrical Code (NEC)
 - b. NFPA 75 Protection of Electronic Computer / Data Processing Equipment
 - c. NFPA 101 Life Safety Code
10. Federal Occupational Safety and Health Administration
11. OSHA Standards 29 CFR 1926 and 1910
12. Underwriters Laboratories, Inc.
 - a. UL Listed
 - b. UL Approved

1.4 GLOSSARY

- | | | |
|----|-------|---|
| A. | ANSI | American National Standards Institute |
| B. | ASTM | American Society of Testing and Materials |
| C. | BICSI | Building Industry Consulting Services International |
| D. | dBm | Decibels with reference to one milliwatt |
| E. | EIA | Electronic Industries Association |
| F. | EMI | Electromagnetic Interference |
| G. | FCC | Federal Communications Commission |
| H. | IEEE | Institute of Electrical and Electronics Engineers |
| I. | MHz | Megahertz |
| J. | NEC | National Electric Code |
| K. | NEMA | National Electrical Manufacturer's Association |
| L. | NFPA | National Fire Protection Association |
| M. | NRTL | National Recognized Testing Laboratories |
| N. | OSHA | Occupational Safety and Health Administration |
| O. | RF | Radio Frequency |
| P. | RCDD | Registered Communications Distribution Designer |

- Q. TIA Telecommunications Industry Association
- R. TGB Telecommunications Grounding Busbar
- S. TMGB Telecommunications Main Grounding Busbar
- T. UL Underwriter's Laboratories, Inc.
- U. UTP Unshielded Twisted Pair

1.5 DEFINITIONS

- A. Every effort has been made to use industry standard terminology throughout this specification, but industry standard terminology is not used by all manufacturers and in many cases, industry standard terminology does not exist. Contractor shall notify the Architect and/or Engineer to define any terminology used in this Specification if they believe any question could arise.
- B. "Architect": the Architect of record
- C. "As Directed": as directed by the Commissioner
- D. "Connect": shall mean make final electrical connections for a complete operating piece of equipment.
- E. "Contractor": the individual, partnership or corporation to whom the Contract for the Telecommunications work has been awarded.
- F. "Engineer": the Engineer of record
- G. "Equal": shall be of the same quality, appearance and utility to that specified, as determined by the Commissioner. Contractor bears the burden of proof of equality
- H. "Finished Spaces": spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcited spaces, crawlsapces, and tunnels.
- I. "Furnish": to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories, and all other items customarily required for the proper and complete application
- J. "Install": to join; unite; fasten; link; attach; set up or otherwise connect together; complete, tested, and ready for normal satisfactory operation
- K. Owner: City of New York
- L. "Provide": shall mean furnish and install complete with all details and ready or use
- M. "Submit": submit to the Commisioner for review

1.6 SUBMITTALS

- A. General Procedures

1. All submittals shall comply with the requirements of Division 01.
 2. Forward all submittals in related groups. Individual or incomplete submittals are not acceptable.
 3. Labeling shall be approved by Commissioner prior to testing of cables.
 4. Identify each item by manufacturer, brand, trade name, number, size, rating, or whatever other data is necessary to properly identify and check materials and equipment.
 5. Identify each submittal item by reference to Specification Section paragraph in which item is specified, or *Drawing and Detail number*
 6. Prepare details not less than ¼ inch = 1 foot scale.
 7. Contents: Each submittal shall contain the following information:
 - a. Project name and address
 - b. Number of submittal
 - c. Date of submittal
 - d. Name and address of contractor
 - e. Table of contents
 - f. Product name and manufacturer
 - g. Page number(s)
 - h. Page number(s) of the corresponding Specification or Drawing number(s) of the corresponding Contract Documents.
 8. LEED Certification Documentation: Submit documentation from the manufacturer highlighting LEED requirements for materials and products to be used for this project. Comply with the LEED submittal requirements of Division 01 Section "LEED Submittals"
- B. List of Submittals
1. Pre-Construction Submittals:
 - a. Product data sheets
 - b. Shop drawings
 - c. Factory tests
 - d. Proof of certification as a certified installer for the system(s) to be installed
 - e. Proof of project registration with system manufacturer(s) for extended warranty
 - f. Manufacturer product and application wiring for approval
 2. During Construction:
 - a. Installation/commissioning schedules
 - b. Pull schedules
 - c. Field test reports

3. Commissioning:
 - a. Commissioning plans
 - b. Method statements
 - c. Testing and commissioning schedules
 4. Post Construction:
 - a. As-built drawings (both hard copy and electronic copy)
 - b. Warranties
- C. Product Data Sheets
1. Product Data Sheets shall include construction details, material descriptions, dimensions of individual components and profiles and finishes. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
 2. Certify that the data sheets depict the components to be installed to make up the complete system as described in the Contract Documents.
 3. Contents: The product data sheet submittal shall consist of the following:
 - a. Cover Sheet
 - b. Project name and address
 - c. Number of submittal
 - d. Date of submittal
 - e. Name and address of the Communications Contractor
 - f. Table of Contents
 - g. Product name and manufacturer
 - h. Page number(s)
 - i. Page number(s) of the corresponding Specification or drawing number(s) of the corresponding Contract Documents.
 - j. Manufacturers' technical specifications and data sheets of all items specified herein. Submit pertinent pages only.
 - k. Identify clearly the particular product being submitted; do not use highlighters. Use appropriate markings and arrows.
 - l. Identify any options or accessories that are applicable to the project.
 - m. Show compliance with specified standards.
 - n. Show compliance with any parameters required by this specification.
 - o. Show compliance with specified testing agency listings; show the limitations of their labels or seals, if any.
 - p. Show any special coordination requirements for the product.
 4. Preparation and Transmittal
 - a. Submit all product data sheet submittals including resubmittals as one submittal.
- D. Samples
1. Submit samples of cables and outlets fully labeled and other accessories to be installed under these Contract Documents.
 2. Provide samples physically identical with proposed material or product.
 3. Where selection is required, provide full set of all options.
 4. Where non-specified products are proposed, provide full set of all options.

E. Shop Drawings and Calculations

1. Contents: Each shop drawing submittal shall consist of the following:
2. Title Block:
 - a. Project name and address
 - b. Number of submittal
 - c. Date of submittal
 - d. Name and address of the Communications Contractor
 - e. Drawing scale
3. Diagrams showing evidence of compliance with Contract Documents and coordination with other trades.
4. Associated wiring diagrams of all equipment, with types and model numbers specified under these Contract Documents.
5. Submit drawings (to scale) showing:
 - a. Point-to-point wiring diagrams for all cables installed under this work
 - b. Detailed plan views and elevations of all telecommunications spaces showing racks, termination blocks and cable paths
 - c. Equipment and wall elevations, mounting locations and dimensions and labeling of equipment
 - d. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - e. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
 - f. Grounding: Indicate location of grounding bus bar and its mounting detail showing standoff insulators and wall mounting brackets.
 - g. Drawings to show evidence of coordination with other trades
 - h. Sample reports showing the proposed format for cable test reports
 - i. Fully dimensioned housing and mounting drawings, including information on finishes.
 - j. Specific notation of field measurements at accurate scale.
 - k. Identification of specific products and materials used.
 - l. Cross-reference all related Contract Documents (drawings, detail numbers, Specifications sections, etc.)
 - m. Compliance with specified standards.
 - n. Dimensions at accurate scale.
6. Submit calculations for:
 - a. Confirmation of pathways sizing
 - b. WLAN coverage
 - c. Grounding
 - d. Seismic restraint components
7. Preparation and Transmittal
 - a. Do not reproduce Contract Documents as shop drawings.
 - b. Provide space for action marking adjacent to the title block.

- F. Submit all shop drawings submittals for each system, subsystem, or unit of work as one submittal. Pull Schedules
1. Contents: The schedules shall include, but are not limited to:
 - a. Cover Sheet
 - b. Project name and address
 - c. Number of pull schedule submittal.
 - d. Date of pull schedule submittal.
 - e. Name and address of the Communications Contractor.
 2. Schedule fields shall reflect labeling fields.
 3. Schedule fields shall include, as appropriate:
 - a. Sequential line number
 - b. Outlet labeling
 - c. Cable labeling
 - d. Cable Length
 - e. Jack labeling
 - f. Patch Panel/Termination Frame label
 - g. Position/port numbers
 - h. Rack labeling
- G. Factory and Field Test Reports
1. Contents: Each field test submittal shall consist of the following:
 - a. Cover Sheet
 - b. Project name and address
 - c. Number of submittal
 - d. Date of submittal
 - e. Name and address of the Communications Contractor
 - f. Table of Contents
 - g. Component (cable, system, equipment, etc) type and number
 - h. Page number(s)
 - i. Page number(s) of the corresponding Specification or Drawing number(s) of the corresponding Contract Drawings.
 2. Component test results as specified.
 3. Preparation and Transmittal
 - a. During construction submit hard copies printed in a summary format showing one line item per cable tested for all cables. Each line must show the full cable label, test type, cable length, date and time tested and the test result, sorted by cable label. Submit hard copies of the full test result printout for the cables of the furthest two and closest two outlets. Submit a soft copy of the complete test results of all cables tested.
 - b. Submit test results no later than five days after the date of testing.
 - c. Post construction submit hard copies of both the summary and full test format for all cables installed, sorted by cable label. Submit a soft copy consisting of the complete test results.

- d. Submit manufacturer's test record for each reel of cable delivered to the project. Copies of such data are to be kept for inclusion in the documentation and made available to the Commissioner upon request.

H. As-Builts (Record Documents)

1. Contents: Each submittal shall consist of the following:
 - a. Title Block
 - b. Project name and address
 - c. Number of submittal
 - d. Installation schedule, including all cross-connection and patching schedule
 - e. Date of submittal
 - f. Name and address of the Communications Contractor
 - g. Drawing scale
 - h. Floor plans indicating outlet locations and labels.
2. The as-built drawings shall include, but are not limited to block diagrams, frame and cable labeling, cable termination points, equipment room layouts and frame installation details. The as-builts shall include all field changes made up to construction completion:
 - a. Field directed changes to pull schedule.
 - b. Station cable routing changes.
 - c. Riser cable routing or location changes.
 - d. Associated detail drawings.
3. (2) sets of Operation and Maintenance Manuals including wiring diagrams, parts lists, shop drawings and manufacturers' information on all equipment and cables provide by the Contractor. Manuals shall be provided in a high quality, 3-ring binder and completely indexed. Submit manuals to the Commissioner not more than 1 week after project completion.
4. Preparation and Transmittal
 - a. Prepare one single package submittal for both base building and fit out package.
 - b. Prepare as-built packages in an AutoCAD Format.
 - c. Space for action markings shall be adjacent to the title block.
 - d. Provide (2) copies of Record Drawings and (1) electronic copy minimum AutoCAD 2010 format on CD
 - e. Voice cable cross connect schedule (cut sheet) showing detailed identification of cross-connects between riser (house pairs) and horizontal cable runs

I. Qualifications

1. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.
2. Seismic Qualification Certificates: For floor-mounted cabinets, brackets, mounts, cable trays, accessories, and components, from manufacturer.
 - a. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - b. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions. Base certification on the maximum number of components capable of being mounted in each rack type. Identify components on which certification is based.
 - c. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements

- J. Resubmittals will be reviewed for compliance with comments made on the original submittal only and should be marked with a resubmittal number and dated.

1.7 SUBSTITUTIONS, DEVIATIONS AND CHANGES

A. Substitutions

1. Substitutions for the main system components shall be equivalent products from one of the manufacturers included in the list of approved manufacturers.
2. The systems specified in this document shall be an end-to-end solution that is sourced from a single manufacturer or partnered manufacturers.
3. Any proposed substitution in whole or part, must be submitted for review and approval.
4. Any proposed substitutions shall conform to the Contract Documents. Supply proof acceptable to the Commissioner in the form of a written guarantee that the substituted product(s) meet or exceed the Specifications. The substitution must be accepted in writing by the Commissioner.

B. Deviations

1. Any deviations or changes involving extra work are not permissible without prior review and written approval by the Commissioner.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Protect from loss or damage. Replace lost or damaged materials and equipment with new at no increase in Contract Sum.

1.9 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.10 COORDINATION

- A. Carefully check space requirements and the physical confines of the area of work to insure that all material can be installed in the spaces allotted thereto, including conduits and cable supports.
- B. Transmit to the Commissioner in a timely manner all information required for coordinating and related work to be provided in ample time for installation.
- C. Contractor shall note that the construction schedule may dictate that work must be carried out simultaneously on more than one floor.
- D. Attend weekly construction meetings, at the project site or other location, as requested by the Commissioner.
- E. The Contractor shall, without extra charge, make reasonable modifications (coordinated with the Commissioner) in the layout as needed to meet field conditions, prevent conflict with work of other trades, or for proper compliance with the design intent.
- F. The Contractor shall coordinate with the Commissioner with sufficient lead-time to ensure access to secure spaces, and to schedule work to avoid disturbing existing functional spaces – preferably by performing disruptive work at night/early morning hours.
- G. Coordinate arrangement, mounting, and support of communications equipment:
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - 3. To allow right of way for piping and conduit installed at required slope.
 - 4. So connecting pathways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- H. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- I. Coordinate location of access panels and doors for communications items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."
- J. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Firestopping".

1.11 CERTIFICATION AND WARRANTY

- A. All work and all items of equipment and materials shall be warranted for a minimum period of one year from the date of acceptance of the work. Where a manufacturer's warranty is longer than one year, the Contractor shall offer the extended warranty. The Contractor shall, upon notification of any defective items, repair or replace such items within 24 hours without additional cost, all to the satisfaction of the Commissioner.
- B. Furnish a warranty in accordance with DDC General Conditions.

- C. Furnish a manufacturer's "Permanent Link" performance warranty for all EIA/TIA 568-B category 6 workstation cables for a minimum period of 25 years from the date of acceptance of the work. Where a manufacturer's warranty is longer than 25 years, the Contractor shall offer the longer warranty. The "Permanent Link" Performance Warranty shall be issued and signed by the component manufacturer and shall list City of New York as the holder of the warranty. The "Permanent Link" Performance Warranty shall cover labor and material for all "Link" components. Describe your ability of offer such a manufacturer's extended warranty.

PART 2 - PRODUCTS

2.1 SLEEVES FOR PATHWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral water-stop, unless otherwise indicated.

2.2 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.
1. Manufacturers: Subject to compliance with requirements, or comparable product by one of the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc.
 - e. Approved equal.
 2. Sealing Elements: interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of pathway or cable.
 3. Pressure Plates: Plastic, or Carbon steel. Include two for each sealing element.
 4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR COMMUNICATIONS INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both communications equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.
- F. Cutting, patching, painting and restoration of any existing surfaces damaged performing the work under the scope.

3.2 SLEEVE INSTALLATION FOR COMMUNICATIONS PENETRATIONS

- A. Communications penetrations occur when pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.
- G. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pathway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
 - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."

- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pathway and cable penetrations. Install sleeves and seal pathway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."
 - K. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.
 - L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between pathway or cable and sleeve for installing mechanical sleeve seals.
- 3.3 SLEEVE-SEAL INSTALLATION
- A. Install to seal exterior wall penetrations.
 - B. Use type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- 3.4 IDENTIFICATIONS
- A. Refer to Division 27 Section "Identification for Communications Systems"
 - B. Comply with TIA/EIA-606-A
 - C. Comply with requirements in Division 26 Section "Identification for Electrical Systems"
- 3.5 GROUNDING
- A. Refer to Division 27 Section "Grounding and Bonding for Communications Systems"
 - B. Comply with ANSI-J-STD-607-A
 - C. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems"
- 3.6 FIRESTOPPING
- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for communications installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Firestopping."

END OF SECTION 27 05 00

SECTION 27 05 53 - IDENTIFICATION FOR TELECOMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. The work shall consist of but not limited to:
1. Provide the material and labor to label all components of the Premises Distribution Systems which includes but not limited to:
 2. All copper and fiber optic backbone cables, and associated termination frames and panels.
 3. All horizontal (station) cabling for copper and fiber, and associated termination patch panels, and outlet faceplates and connectors.
 4. All other equipment and pathways related to Division 27, as described in TIA 606-A standard.
- B. Provide all required records for Class 1 Administration as described by of TIA 606-A standard.
- C. Related Sections:
1. Division 27 Section "Common Work Results For Communications"
 2. Division 27 Section "Telecommunications Cabinets, Racks, Frames and Enclosures"
 3. Division 27 Section "Communications Backbone Cabling."
 4. Division 27 Section "Communications Horizontal Cabling."

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Submit actual Label samples. Failure to include actual label samples with the submittal package for this Section shall lead to rejection of the submittal.
- C. Submit labels on project record documents (as builds) reflecting the actual labels installed.

1.3 QUALITY ASSURANCE

- A. Comply with TIA/EIA-606-A.

1.4 CLASS OF ADMINISTRATION

- A. The labeling scheme used shall meet all the requirements of a Class 1 facility as defined by ANSI/TIA/EIA 606-A, Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
- B. Type, format, wording, printing, and placement of labels shall be coordinated with Commissioner's existing administration plan. Items and/or issues not addressed in an established administration plan shall be addressed in accordance with TIA/EIA 606-A Standard (e.g. cable tray, conduits, junction boxes, grounding systems, etc).

- C. All annexes to the ANSI/TIA/EIA 606-A standard shall be followed, unless approved by the Commissioner, in writing.

1.5 COORDINATION

- A. Coordinate the labeling scheme for the communications systems with the Commissioner.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Comply with requirements of TIA/EIA-606-A and UL969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. Comply with requirements of Division 26 Section "Identification for Electrical Systems".
- C. The identification for the communications systems shall meet all the requirements of a Class 3 facility as defined by ANSI/TIA/EIA 606-A, Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
- D. Identify all the components of the communications systems.
- E. For fire-resistant plywood, do not paint over manufacturer's label.
- F. Labels shall be preprinted or computer-printed type.
- G. Type, format, wording, printing, and placement of labels shall be coordinated the established administration plan and shall be addressed in accordance with TIA/EIA 606-A Standard (e.g. cable tray, conduits, junction boxes, grounding systems, etc).
- H. Labeling System
 - 1. PC-based software, WINDOWS compatible, capable of supporting alpha numeric characters and Windows True Type Fonts.
 - 2. Compatible with laser printers.
 - 3. Label sizes supported:
 - a. Minimum: 0.8" W x 0.2" H.
 - b. Maximum: 3.0" W x 12.0" H.

PART 3 - EXECUTION

3.1 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements in Division 26 Section "Identification for Electrical Systems".
- B. See Division 27 Section "Communications Horizontal Cabling" for additional identification requirements. See Evaluations for discussion of TIA/EIA standard as it applies to this Section. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 1 level of administration including optional identification requirements of this standard.

- C. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels; comply with TIA/EIA-606-A.
- D. See Evaluations for discussion about TIA/EIA standard as it applies to this Section. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 1 level of administration, including optional identification requirements of this standard.
- E. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- F. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.
- G. Cable and Wire Identification:
1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
 2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
 3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).
 4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
 - a. Individually number the wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or
 - b. cabinet to a building-mounted device with name and number of particular device as shown.
 - c. Label each unit and field within distribution racks and frames.
 5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
- H. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA 606-A, for the following:
1. Cables use flexible vinyl or polyester that flexes as cables are bent.

END OF SECTION 27 05 53

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SECTION 27 11 16 - TELECOMMUNICATIONS CABINETS, RACKS, FRAMES AND ENCLOSURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This section encompasses requirements related to all communications spaces: Telecom Enclosure (TE1).
- B. Section Includes:
 - 1. Telecommunications mounting elements.
 - 2. Grounding.
- C. Related Sections:
 - 1. Division 27 Section "Common Work Results for Communications"
 - 2. Division 27 Section "Telecommunications Backbone Cabling" for voice and data cabling associated with system panels and devices.
 - 3. Division 27 Section "Telecommunications Horizontal Cabling" for voice and data cabling associated with system panels and devices.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For communications equipment room fittings. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies, and location and size of each field connection.
 - 2. Equipment racks and cabinets: Include workspace requirements and access for cable connections.
 - 3. Grounding: Indicate location of grounding bus bar and its mounting detail.
- C. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.
- D. Grounding: Comply with ANSI-J-STD-607-A.

1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install equipment frames and cable trays until spaces are enclosed and weather-tight, wet work in spaces is complete and dry, and work above ceilings is complete.

1.5 COORDINATION

- A. Coordinate layout and installation of communications equipment with **the** telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.
1. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and **Commissioner** to exchange information and agree on details of equipment arrangements and installation interfaces.
 2. Record agreements reached in meetings and distribute them to other participants.
 3. Adjust arrangements and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.

PART 2 - PRODUCTS

2.1 PATHWAYS

- A. Cable Support: NRTL labeled. Cable support brackets shall be designed to prevent degradation of cable performance and pinch points that could damage cable. Cable tie slots for fastening cable ties to brackets.
1. Comply with NFPA 70 and UL 2043 for fire-resistant and low-smoke-producing characteristics.
 2. Support brackets with cable tie slots for fastening cable ties to brackets.
 3. Lacing bars, spools, J-hooks, and D-rings.
 4. Straps and other devices..
- B. Ladder racks: Refer to Division 27 Section "Horizontal Cabling"
- C. Sleeves for Pathways and Cables: Refer to Division 27 Section "Common Work Results for Communications"
- D. Conduit and Boxes: Refer to Division 26 Section "Raceway and Boxes for Electrical Systems."

2.2 TELECOMMUNICATIONS ENCLOSURE

- A. Termination racks for the mounting of fiber and copper patch panels, network equipment, and associated patch cords.
- B. Manufacturers:
1. Middle Atlantic Products
 2. Or approved equal.
- C. SR Series Pivoting Rack:

1. EIA compliant 19" pivoting equipment rack, minimum of 42RU space for equipment in the vertical plane. Refer to drawings for the size.
2. Fan knockouts on top and bottom shall allow installation of up to four 4-1/2" fans.
3. Module Dimension: Width compatible with EIA 310 standard, 19-inch (480-mm) panel mounting.
4. Finish: Manufacturer's standard, baked-polyester powder coat.
5. Front doors shall be reinforced 16-gauge steel, LVFD-40 (vented, 68% open area)
6. All racks and cabinets shall be seismically rated and braced according to IBC 1621. The installation shall be signed and sealed by a professional engineer.
7. Provide all mounting components and accessories to securely fix racks to floor.
8. UL listed – 7N69.
9. Load carrying capacity of at least 500 lb.
10. Isolated-grounding kit for each frame.
11. Horizontal cable managers:
 - a. 19-inch (480 mm) rack mountable, 1RU and 2RU high.
 - b. Provide front and rear cable organizers with minimum 5 support rings of 3.5-inch (89 mm) width protrusion minimum.
 - c. Snap on/off protective covers front and rear.

2.3 POWER DISTRIBUTION UNIT (PDU)

A. Manufacturers

1. APC
2. Approved equal

B. General PDU Requirements:

1. cUL and UL listed
2. Each cabinet and rack housing network equipment shall be provided with two (2) PDUs.
3. Input Requirements:
 - a. Input Voltage: 208 volts 3PH
 - b. Maximum Line Current per phase: 20 amperes
 - c. Load Capacity 5700 VA
 - d. Input Connections: NEMA L21-20P
 - e. Cord Length: 10 feet
4. Output Requirements:
 - a. Output Voltage: 120V
 - b. Output Connections: (42) NEMA 5-20R

5. Maximum Height: 6 ft.

2.4 GROUNDING

- A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.
- B. Telecommunications Main Bus Bar:
 1. Connectors: Mechanical type, cast silicon bronze, solderless compression type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
 2. Ground Bus Bar: Copper, minimum 1/4 inch thick by 4 inches wide (6 mm thick by 100 mm wide) with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart.
 3. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.
- C. Comply with ANSI-J-STD-607-A.

2.5 LABELING

- A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION

3.1 GENERAL

- A. Contact telecommunications service provider and arrange for installation of demarcation point, protected entrance terminals, and housing when so directed by service provider. The expansion project will reuse existing incoming service infrastructure.
- B. Comply with NECA 1.
- C. Comply with BICSI TDMM for layout and installation of communications equipment rooms.
- D. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A-7.
- E. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

3.2 FIRESTOPPING

- A. Comply with requirements in Division 07 Section "Penetration Firestopping". Comply with TIA/EIA-569-A, Annex A, "Firestopping".
- B. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.3 GROUNDING

- A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. Comply with ANSI-J-STD-607-A.

- C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.
- D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.4 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements in Division 26 Section "Identification for Electrical Systems".
- B. See Division 27 Section "Communications Horizontal Cabling" for additional identification requirements. See Evaluations for discussion of TIA/EIA standard as it applies to this Section. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 1 level of administration including optional identification requirements of this standard.
 - 1. Labels shall be preprinted or computer-printed type.

END OF SECTION 27 11 16

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SECTION 27 13 23 - TELECOMMUNICATIONS OPTICAL FIBER BACKBONE CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pathways.
2. Fiber optic and UTP cable.
3. Cable connecting hardware, patch panels, and cross-connects.
4. Cabling identification products.

B. Related Sections:

1. 270500 "Common work results for Communications"
2. 270553 "Identification for Communications Systems"
3. 271116 "Telecommunications Cabinets, Racks and Enclosures"

1.2 BACKBONE CABLING DESCRIPTION

A. Backbone cabling system will provide interconnections between the incoming service demark and the Telecom Enclosure (TC) in the telecommunications cabling system structure. Cabling system consists of backbone cables, mechanical terminations, and patch cords or jumpers.

B. Bridged taps and splitters shall not be used as part of backbone cabling.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Backbone cabling system shall comply with transmission standards in TIA/EIA-568-C.0, when tested according to test procedures of this standard.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Commissioner.
2. Cabling administration drawings and printouts.
3. Wiring diagrams to show typical wiring schematics including the following:
 - a. Patch panels.
 - b. Patch cords.
4. Detail mounting assemblies, and show elevations and physical relationship between the installed components.
5. Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements.

- C. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.
- D. Source quality-control reports.
- E. Field quality-control reports.
- F. Maintenance data.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 50 or less.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.
- E. Grounding: Comply with ANSI-J-STD-607-A.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site. Test each pair of UTP cable for open and short circuits.

PART 2 - PRODUCTS

2.1 PATHWAYS

- A. All pathways for communications systems shall comply with TIA/EIA-569-A and BICSI Telecom Distribution Manual.
- B. Comply with the requirements of Division 26 Sections "Hangers and Supports for Electrical Systems", "Raceways and Boxes for Electrical Systems". Cable Trays.
- C. Refer to section 27 15 00 for additional pathway information.

2.2 UTP CABLE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. General Cable Technologies Corporation.
 - 2. CommScope, Inc.
 - 3. Mohawk; a division of Belden CDT.
 - 4. Siemon.
 - 5. approved equal.

- B. Description: 100-ohm, 25-pair UTP, covered with a gray thermoplastic jacket.
1. Comply with ICEA S-90-661 for mechanical properties.
 2. Comply with TIA/EIA-568-B.1 for performance specifications.
 3. Comply with TIA/EIA-568-B.2, Category 3.
 4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
 - a. Communications, Riser Rated: Type CMR, complying with UL 1666.

2.3 FIBER OPTIC CABLE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Corning.
 2. CommScope, Inc.
 3. Mohawk; a division of Belden CDT.
 4. Siemon.
 5. Approved equal.
- B. Description: multi-mode inside plant optical fiber, OS1 type, with fiber counts as indicated on drawings, with mechanical and transmission performance specifications that meet or exceed ANSI/TIA/EIA-568-C.3
1. Comply with TIA/EIA-568-C.0
 2. Comply with TIA/EIA-598-C.3
 3. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
 - a. Communications, Riser Rated: Type CMR, complying with UL 1666.

2.4 UTP CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Panduit Corp.
 2. Siemon Co.
 3. CommScope.
 4. Approved equal.
- B. General Requirements for Connecting Hardware: Comply with TIA/EIA-568-C.2, for connecting hardware.
- C. Connecting Blocks: 110-style IDC for Category 3. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.
- D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
1. Number of Terminals per Field: One for each conductor in assigned cables.

2.5 FIBER OPTIC CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Corning.
 2. Panduit Corp.
 3. Siemon.
 4. CommScope.
 5. Approved equal.
- B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-C.3.
- C. Multi mode fiber optic connectors shall as a minimum conform to the following specifications:
1. Duplex LC multi mode connector
 2. Manufacturer recommended connector for optimal performance with approved cable type
 3. Durability: < 0.2dB change, 500 re-matings, FOTP-21
 4. Reflectance loss: -20dB minimum
 5. Insertion loss of mated pair at 1310 nm and 1550 nm to be less than 0.7 dB at acceptance for every connector
 6. Optimally keyed, allowing reproducible mating conditions each time a connection is made between connector and coupler
 7. Fitted with color-coded strain relief boots to ensure durable and robust connections
 8. Fitted with a tight fitting, polymer cap over the connector to prevent ingress of dirt and dust until the connector is fitted to a coupler
 9. All connectors to be straight-pull and side-pull resistant, preventing accidental optical disconnect; comply with FOTP-21

2.6 FIBER OPTIC PATCH CORDS

- A. Install and connect equipment in the racks. Contractor shall include patch cords duplex multi-mode fiber for 25% of multi-mode strands installed in each room and for additional cords. Coordinate patch cord length for a neat installation.
- B. Description: Optical fiber patch cords for use with patch panels.
- C. Specifications:
1. Fiber type: multi-mode, tight buffer construction.
 2. Patch cord outside diameter: 3.0mm
 3. Patch cord minimum length: 3m
 4. Connectors of same specifications as the one used in the patch panels.
 5. Cords shall meet or exceed the minimum mechanical and optical characteristics for optical fiber patch cords as specified in ANSI/TIA/EIA-568-C.3.
- D. Configuration: 2-strand, Duplex construction; to match optical patch panel connector type.
- E. Acceptable manufacturers:
1. Corning.
 2. Panduit Corp.
 3. Siemon Co.

4. CommScope.
5. Approved Equal

2.7 GROUNDING

- A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems." for grounding conductors and connectors.
- B. Comply with ANSI-J-STD-607-A.

2.8 IDENTIFICATION PRODUCTS

- A. Comply with TIA/EIA-606-A, TIA-598, and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. Refer to section 27 05 53.

2.9 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test cables on reels according to TIA/EIA-568-B.2.
- C. Field test UTP cables according to TIA/EIA-568-C.0.
- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

- A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

3.2 WIRING METHODS

- A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, in attics, and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.
 1. Install plenum cable in environmental air spaces, including plenum ceilings.
 2. Comply with requirements for raceways and boxes specified in Division 26 Section "Raceway and Boxes for Electrical Systems."
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.3 INSTALLATION OF PATHWAYS

- A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A.
- B. Comply with requirements for demarcation point, pathways, cabinets, and racks specified in Division 27 Section "Communications Equipment Room Fittings." Drawings indicate general arrangement of pathways and fittings.
- C. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.
- D. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.
- E. Install manufactured conduit sweeps and long-radius elbows whenever possible.
- F. Pathway Installation in Communications Equipment Rooms:
 - 1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
 - 2. Install cable trays to route cables if conduits cannot be located in these positions.
 - 3. Secure conduits to backboard when entering room from overhead.
 - 4. Extend conduits 3 inches (76 mm) above finished floor.
 - 5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- G. Backboards: Install backboards with 96-inch (2440-mm) dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

3.4 INSTALLATION OF CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
 - 1. Comply with TIA/EIA-568-C.0.
 - 2. Comply with BICSI ITSIM, Ch. 6 "Cable Termination Practices."
 - 3. Install 110-style IDC termination hardware unless otherwise indicated.
 - 4. Terminate all conductors; no cable shall contain un-terminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
 - 5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - 6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
 - 7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
 - 8. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
 - 9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.

10. Pulling Cable: Comply with BICSI ITSIM, Ch. 4 "Pulling Cable." Monitor cable pull tensions.
- C. UTP Cable Installation:
1. Comply with TIA/EIA-568-B.2.
 2. Do not untwist UTP cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.
- D. Fiber Optic Cable Installation:
1. Comply with TIA/EIA-568-C.0.
 2. Do not exceed minimum bend radius recommended by the manufacturer at all times
 3. Use innerduct at any times the fiber cables are mixed with other media type in the same pathway.
- E. Open-Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
 2. Suspend UTP cable not in a wireway or pathway, a minimum of 8 inches (200 mm) above ceilings by cable supports not more than 60 inches (1524 mm) apart.
 3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
- F. Group connecting hardware for cables into separate logical fields.
- G. Separation from EMI Sources:
1. Comply with BICSI TDMM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
 2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (610 mm).
 3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).

- c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).
4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
- a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (76 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).
 - d. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
 - e. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.5 FIRESTOPPING

- A. Comply with requirements in Division 07 Section "Penetration Firestopping." Comply with TIA/EIA-569-A, Annex A "Firestopping."
- B. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.6 GROUNDING

- A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. Comply with ANSI-J-STD-607-A.
- C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.
- D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.7 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

1. Administration Class: 1.
 2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
- B. See Evaluations for discussion about TIA/EIA standard as it applies to this Section. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 1 level of administration, including optional identification requirements of this standard.
- C. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations.
- D. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- E. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.
- F. Cable and Wire Identification:
1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
 2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
 3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).
 4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
 - a. Individually number the wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device with name and number of particular device.
 - b. Label each unit and field within distribution racks and frames.
 5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware.
- G. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA 606-A, for the following:
1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.8 FIELD QUALITY CONTROL

- A. Tests and Inspections:
1. Visually inspect UTP jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-C.0.

2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 3. Test UTP copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
 4. Test fiber optic cable in accordance with TIA/EIA-568-C.3.
- B. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
- C. Remove and replace cabling where test results indicate that they do not comply with specified requirements.
1. Prepare test and inspection reports.

END OF SECTION 27 13 23

SECTION 27 15 00 - TELECOMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pathways.
 - 2. UTP cabling.
 - 3. Cable connecting hardware, patch panels, and cross-connects.
 - 4. Telecommunications outlet/connectors.
 - 5. Cabling identification products.
 - 6. Cabling administration system.
- B. Related Sections:
 - 1. Division 27 Section "Common Work Results For Communications".
 - 2. Division 27 Section "Telecommunications Cabinets, Racks and Enclosures".
 - 3. Division 27 Section "Identification for Communications Systems".

1.2 HORIZONTAL CABLING DESCRIPTION

- A. Horizontal cable and its connecting hardware (Cabling Subsystem 1) provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the Telecom Enclosure (TE1) in ART-NY office on Lower Meszzanine. This cabling and its connecting hardware are called "permanent link," a term that is used in the testing protocols.
- B. Additionally, the contractor shall install the Cat 6 cabling for the lighting control, as shown on TL series drawings (going to Control Booths).
- C. TIA/EIA-568-C.0 specifies that the cable lengths are dependent on the application and upon the media chosen. All Ethernet applications are limited to 100 m on UTP media; therefore the maximum permanent link length is 95 m (295'). Analog phone, fax and ISDN applications are allowed to exceed this limitation.
- D. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
- E. Bridged taps and splices shall not be installed in the horizontal cabling.

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1 and TIA/EIA-568-B.2 when tested according to test procedures of this standard.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Shop Drawings:
 - 1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by the Commissioner.
 - 2. Cabling administration drawings and printouts.
 - 3. Wiring diagrams to show typical wiring schematics, including the following:
 - a. Cross-connects.
 - b. Patch panels.
 - c. Patch cords.
 - 4. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.
 - 5. Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements. Include the following:
- C. Samples: For workstation outlets, jacks, jack assemblies, and faceplates for color selection and evaluation of technical features.
- D. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.
- E. Source quality-control reports.
- F. Field quality-control reports.
- G. Maintenance data.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 50 or less.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.
- E. Grounding: Comply with ANSI-J-STD-607-A.

PART 2 - PRODUCTS

2.1 PATHWAYS

- A. All pathways for communications systems shall comply with TIA/EIA-569-A and BICSI Telecom Distribution Manual.
- B. Comply with the requirements of Division 26 Sections "Hangers and Supports for Electrical Systems", "Raceways and Boxes for Electrical Systems".
- C. Cable Support:
 - 1. Provide all fittings and accessories required to protect, support and install a cable tray support system.
 - 2. NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
 - 3. Support brackets with cable tie slots for fastening cable ties to brackets.
 - 4. Lacing bars, spools, J-hooks, and D-rings.
 - 5. Straps and other devices.
- D. Cable Trays:
 - 1. Wire basket style tray for distribution of backbone and horizontal cabling. Provide all fittings and accessories required to protect, support and install the cable tray system. Provide cable drop outs to maintain proper bend radius for cables leaving the tray.
 - 2. Cable Tray Material: Metal, suitable for indoors, and protected against corrosion by electroplated zinc galvanizing, complying with ASTM B 633, Type 1, not less than 0.000472 inches (0.012 mm) thick.
 - 3. Cable tray size as shown on the floor plans. Wire mesh spacing shall not exceed 2 by 4 inches (50 by 100 mm).
 - 4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Legrand - Cablofil
 - b. Cooper B-Line, Inc.
 - c. GS Metals Corp.
 - d. Wiremold
 - e. Approved equal
 - 5. Provide all fittings and accessories required to protect, support and install a ladder rack support system.
 - 6. Provide cable runaway radius drop at cable transitions from tray to racks.
 - 7. Provide grounding clamps and #6 AWG ground wire.

2.2 UTP CABLE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. General Cable Technologies Corporation.
 - 2. Siemon Co. (The).
 - 3. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

4. Approved equal.
- B. Description: 100-ohm, 4-pair UTP, covered with a blue thermoplastic jacket.
1. Comply with ICEA S-90-661 for mechanical properties.
 2. Comply with TIA/EIA-568-C.0 for performance specifications.
 3. Comply with TIA/EIA-568-B.2, Category 6.
 4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
 - a. Communications, Plenum Rated: Type CMP, complying with NFPA 262.

2.3 UTP CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Panduit Corp.
 2. Siemon Co. (The).
 3. Tyco Electronics/AMP Netconnect; Tyco International Ltd.
 4. Approved equal.
- B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.
- C. Connecting Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.
1. Number of Terminals per Field: One for each conductor in assigned cables.
- D. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
1. Number of Jacks per Field: One for each four-pair UTP cable indicated, plus spares and blank positions adequate to suit specified expansion criteria.
- E. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.
- F. Patch Cords: Factory-made, four-pair cables in 48-inch (1200 mm), 72-inch (1800-mm), 96-inch (2400 mm), and 120" (3600 mmm) lengths; terminated with eight-position modular plug at each end.
1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
 2. Provide one patch cord for each outlet plus 25% spare at each end.
 3. Provide station cords in 96"(90%) and 120"(10%) lengths
 4. Provide various lengths of patch cords at the CC end as to assure a neat installation.
 5. Provide unit prices for each length of patch cords to be used for additional patch cords as needed.

2.4 TELECOMMUNICATIONS OUTLET/CONNECTORS

- A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-B.1.
- B. Workstation Outlets: Two and Four -port-connector assemblies mounted in single faceplate. Refer to detail drawings for configurations.
 - 1. Plastic Faceplate: High-impact plastic. Coordinate color with Division 26 Section "Wiring Devices."
 - 2. Metal Faceplate: Stainless steel, complying with requirements in Division 26 Section "Wiring Devices."
 - 3. For use with snap-in jacks accommodating any combination of UTP work area cords.
 - a. Flush mounting jacks, positioning the cord at a 45-degree angle.
 - 4. Factory labeled by silk-screening or engraving for stainless steel faceplates.
 - 5. Machine printed, in the field, using adhesive-tape label.
 - 6. Snap-in, clear-label covers and machine-printed paper inserts.

2.5 GROUNDING

- A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.
- B. Comply with ANSI-J-STD-607-A.
- C. Telecommunications Grounding Bus Bar
 - 1. The TGB must be a predrilled copper busbar with holes for use with standard- sized lugs, have a minimum dimensions of 6.3 mm (0.25 in) thick by 51 mm (2 in) wide, and variable length. It must be listed by an NRTL.
 - 2. Hole patterns on the Busbars shall accommodate two-hole lugs per the recommendation of BICSI and ANSI-J-STD-607-A standards.
 - 3. Insulators shall electrically isolate Busbars from the wall, or other mounting surfaces, thereby controlling the current path.
 - 4. Provide required stainless steel hardware to fasten the two-hole ground lugs to the Busbar.
- D. Grounding Conductors
 - 1. Telecommunications grounding connectors shall have a minimum size of 6/0 AWG.
 - 2. Telecommunications Bonding Backbone shall be size 2/0 AWG.
 - 3. All Telecommunication grounding conductors shall be copper conductors, calculated so that no more than 40 V can be present along its entire length.

2.6 IDENTIFICATION PRODUCTS

- A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. Comply with requirements in Division 27 Section "Identification for Communications Systems".

- C. Comply with requirements in Division 26 Section "Identification for Electrical Systems".

2.7 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test UTP cables according to TIA/EIA-568-B.2.
- C. Cable will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WIRING METHODS

- A. Cabling and its installation shall comply with authority having jurisdiction (AHJ) and applicable regulations.
- B. The cable shall not be subjected to pulling tension exceeding the pulling strength rating of the cable.
- C. The cable bend radius shall be greater than or equal to the minimum bend radius requirement during and after installation.
- D. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, in attics, and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.
 - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
 - 2. Comply with requirements for raceways and boxes specified in Division 26 Section "Raceway and Boxes for Electrical Systems."
- E. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- F. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.
- G. Maintain compatibility with the environmental conditions by means of enhanced cabling components, protection, separation, and isolation applicable to each area; refer to Annex F of ANSI/TIA-568-C.0.

3.2 INSTALLATION OF PATHWAYS

- A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A-7.
- B. Comply with requirements for demarcation point, pathways, cabinets, and racks specified in Division 27 Section "Communications Equipment Room Fittings." Drawings indicate general arrangement of pathways and fittings.

- C. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.
- D. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.
- E. Install manufactured conduit sweeps and long-radius elbows whenever possible.
- F. Pathway Installation in Communications Equipment Rooms:
 - 1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
 - 2. Install cable trays to route cables if conduits cannot be located in these positions.
 - 3. Secure conduits to backboard when entering room from overhead.
 - 4. Extend conduits 3 inches (76 mm) above finished floor.
 - 5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- G. Backboards: Install backboards with 96-inch (2440-mm) dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

3.3 INSTALLATION OF CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
 - 1. Comply with TIA/EIA-568-C.0.
 - 2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
 - 3. Install 110-style IDC termination hardware unless otherwise indicated.
 - 4. MUTOA shall not be used as a cross-connect point.
 - 5. Consolidation points may be used only for making a direct connection to telecommunications outlet/connectors:
 - a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to workstation equipment.
 - b. Locate consolidation points for UTP at least 49 feet (15 m) from communications equipment room.
 - 6. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
 - 7. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - 8. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
 - 9. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
 - 10. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.

11. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
 12. In the communications equipment room, install a 10-foot- (3-m-) long service loop on each end of cable.
 13. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
- C. UTP Cable Installation:
1. Comply with TIA/EIA-568-B.2. and TIA/EIA-568-C.0
 2. Do not untwist UTP cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.
- D. Open-Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
 2. Suspend UTP cable not in a wireway or pathway a minimum of 8 inches (200 mm) above ceilings by cable supports not more than 60 inches (1524 mm) apart.
 3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
- E. Group connecting hardware for cables into separate logical fields.
- F. Separation from EMI Sources:
1. Comply with BICSI TDMM and TIA/EIA-569-A for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
 2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (610 mm).

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).
4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (76 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).
 - d. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
5. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.4 FIRESTOPPING

- A. Comply with requirements in Division 07 Section "Penetration Firestopping."
- B. Comply with TIA/EIA-569-A, Annex A, "Firestopping."
- C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.5 GROUNDING

- A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. Comply with ANSI-J-STD-607-A.
- C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

- D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
 - 1. Administration Class: 1.
 - 2. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers, and labels.
- B. Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.
- C. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 1 level of administration, including optional identification requirements of this standard.
- D. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- E. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606-A. Furnish electronic record of all drawings, in software and format selected by the Commissioner.
- F. Cable and Wire Identification:
 - 1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
 - 2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
 - 3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).
 - 4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
 - a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
 - b. Label each unit and field within distribution racks and frames.
 - 5. Identification within Connector Fields in Communications Rooms and Communications Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

- G. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA-606-A.
1. Cables use flexible vinyl or polyester that flex as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visually inspect UTP cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
2. Visually confirm Category 6, marking of outlets, cover plates, outlet/connectors, and patch panels.
3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
4. Test UTP backbone copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
5. UTP Performance Tests:
 - a. Test for each outlet and MUTOA. Perform the following tests according to TIA/EIA-568-B.2:
 - 1) Wire map.
 - 2) Length (physical vs. electrical, and length requirements).
 - 3) Insertion loss.
 - 4) Near-end crosstalk (NEXT) loss.
 - 5) Power sum near-end crosstalk (PSNEXT) loss.
 - 6) Equal-level far-end crosstalk (ELFEXT).
 - 7) Power sum equal-level far-end crosstalk (PSELFEXT).
 - 8) Return loss.
 - 9) Propagation delay.
 - 10) Delay skew.

6. Final Verification Tests: Perform verification tests for UTP systems after the complete communications cabling and workstation outlet/connectors are installed.
 - a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.
 - b. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.
- B. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
- C. Prepare test and inspection reports.

3.8 DEMONSTRATION

1. Engage a factory-authorized service representative to train the maintenance personnel in cable-plant management operations, including moves adds and changes, and keeping records of cabling assignments and revisions when extending wiring to establish new workstation outlets.

END OF SECTION 27 15 00

SECTION 27 41 16 - AUDIO AND AUDIOVISUAL SYSTEMS

PART 1 - GENERAL

1.1 CONDITIONS & REQUIREMENTS

- A. Refer to Bidding Requirements, Contract Forms, Conditions of Contract, and Division 1, General Requirements. All of the provisions listed or specified therein apply to work under this section.

1.2 DESCRIPTION

- A. Scope of Work: This specification section defines certain audio and audiovisual systems to be installed in Theatre 1 and Theatre 2 and support spaces as shown in the T-AV drawings.
- B. Definition of Terms:
1. The term "shall" is mandatory; the term "will" is informative; the term "should" is advisory; and the term "provide" means furnish and install.
 2. The term "custom" indicates systems or components that shall be fabricated by the Contractor based on these specifications and drawings.
 3. The term "OFE" refers to City of New York Furnished Equipment. Provide for removal, relocation and testing prior to installation. Coordinate the integration of existing components or new components, provided by the City of New York into the audiovisual system. Provide required mounting hardware, rack panels, cable, connectors, etc. to ensure proper operation of the OFE systems as specified.
 4. The term "A/R" indicates component quantities as required.
 5. The term "NIC" refers to work or equipment that is not in contract covered in this section.
 6. The term "future" indicates equipment that will be added to the systems by the City of New York or City of New York representative at a later date. Provisions shall be made for this equipment.
 7. The term "or equal" indicates equal in materials, size, color, design, function, efficiency of specified, and conforming with base bid manufacturer/model.
- C. Section Includes:
1. Supply and install a turnkey audio and audiovisual system, to include equipment and materials, whether specifically mentioned herein or not, to ensure a complete and operating system.
 2. Generate submittal information for the complete fabrication, installation and wiring of the system. Provide (or sub-contract for) the on-site installation and wiring, and provide on-going supervision and coordination during implementation.
 3. Provide for the initial adjustment of the systems as herein prescribed and provide test equipment for the system checkout and acceptance tests. Prior to the systems acceptance tests, submit an initial testing and tuning report showing methods and results for tests performed.
 4. Provide on-the-job training in the operation and maintenance of the systems for personnel designated by the City of New York.
 5. Provide one-year guarantee from date of system acceptance for systems installed.
- D. Related Work: Equipment and materials provided and installed by others, unless otherwise indicated in this section or on the related drawings, will include the following:

1. Division 9: Structural work, wall openings, fire prevention and safety devices, rough and finished trim, painting and patching, drapes, carpets, floor coverings, glazing, and acoustical treatments
2. Division 12: Furniture, desks, chairs, and casework.
3. Division 26: Conduits, wireways, connection boxes, pull boxes, junction boxes, floor-boxes, ceiling loudspeaker enclosures, and outlet boxes permanently installed in walls, floors, and ceilings; Electrical breaker panels required to power the audiovisual and television equipment; Lighting fixtures, dimmers, power receptacle outlets, and interconnecting wiring for these circuits.

1.3 REFERENCES

- A. Codes: Work shall be performed in accordance with applicable requirements of governing codes, rules and regulations including the following minimum standards, whether statutory or not:

1. Uniform Building Code (UBC)
2. National Electric Code (NEC)
3. National Fire Protection Association (NFPA)
4. Federal Communications Commission (FCC)
5. City, and other local codes and requirements

- B. Standards: Equipment and materials specified shall conform to the current edition of the following standards where applicable:

1. UL – Underwriters' Laboratories
2. ASTM – American Society for Testing Materials
3. NEMA – National Electrical Manufacturer's Association
4. ANSI – American National Standards Institute
5. ETL – Electrical Testing Laboratories
6. SMPTE – Society of Motion Picture and Television Engineers
7. EIA – Electronic Industries Association
8. ISO – International Standards Organization
9. SCTE – Society of Cable Television Engineers
10. Sound Systems Engineering, 3rd Ed., Davis and Petronis, Howard W. Sams Co., 2006.

1.4 SYSTEM DESCRIPTION

- A. Provide system described below in the following spaces:

1. Theatre 1
2. Theatre 2

- B. Work includes the following:

1. C1 Wireless Microphone Kit
2. C2 Wireless Microphone Kit
3. D1 Video Playback
4. D2 Video Playback
5. E1 Sound Console
6. E2 Sound Console

- 7. H1 Projector Package
- 8. H2 Projector Package

C. Paging and playback for lobbies and support

1. Paging zones are broken down as follows:

Zone	Description	Amplifier Channel
M	Theatre 1 Green Corridor	1
K	Theatre 1 Dressing Room 2	1
L	Theatre 1 Dressing Room 1	1
H	Theatre 1 Office	2
J	Theatre 1 Prop Shop	3
O	Theatre 1 Control Room	4
N	Theatre 1 Lobby West	5
R	Theatre 1 Lobby East	5
D	Theatre 2 Lobby	6
C	Theatre 2 Control Booth	7
B	Theatre 2 Dressing Room 1	8
A	Theatre 2 Dressing Room 2	8

2. Paging Mic and Control (PS)

- a. Illuminated, momentary pushbuttons will select paging to either the Public areas, the productions areas, or as an "All Call" to all areas see matrix below.

Page Station	A	B	C	D	R	N	O	J	H	L	K	M	All Zones	BOH	FOH
Theatre 1															
Office					x	x	x	x	x	x	x	x	x	x	x
Control Booth					x	x		x	x	x	x	x		x	x
Lobby	x	x			x	x	x	x	x	x	x	x		x	x
Theatre 2															

Control Booth	x	x		x	x	x									x	x
Lobby	x	x	x	x	x	x									x	x

3. Paging Selector Switches (PSS)

a. Paging selector switches shall assign program audio from:

- 1) Show relay microphone in the Theatre 1
- 2) Show relay microphone in the Theatre 2
- 3) Patchbay input(s) in the Theatre 1
- 4) Patchbay input(s) in the Theatre 2

4. Playback will be via 70v loudspeakers mounted to the ceilings or walls.

D. Sound Reinforcement and Playback System

1. The system shall provide high quality live sound reinforcement and playback of prerecorded sound program within the theatre.
2. Audio coverage for the main floor seating will be provided by powered, modular, processor controlled demountable loudspeakers.
3. Subwoofer loudspeakers will also be powered and demountable.
4. An eight-channel wireless microphone system will be available for the performers, using diversity antenna systems.
5. Provide multi-microphone input receptacles and an associated stagebox multi-conductor snake system via multi-pin receptacle panels located at panel locations distributed around the theatre. These panels will support the mic'ing and reinforcement of live performers within the Theater area.
6. Provide termination for the fixed and wireless microphone inputs at a patch panel in the Control Booth, where they may be assigned to any of the console inputs.
7. Audio monitoring of signals in the control booth, and at mixing position located mid-house with signal connectivity will be provided for via floor boxes and custom input panels.
8. Provide production signal processing, patching, playback and control elements in two half-height equipment racks for use in the control booth or at an in-house mix position.
9. Provide system-wide audio signal processing (equalization, delay, matrix mixing and distribution) of the audio signals using digital signal processing (DSP) equipment, to be located within the control booth equipment racks.
10. DSP shall be configured to for the following presets (reference TS drawings for layouts):

a. Theatre 1

- 1) End Stage
- 2) Thrust
- 3) Flat Floor
- 4) Arena

b. Theatre 2

- 1) End Stage

- c. Each preset shall be configured for Left, Center, and Right output channels for each audience area with subwoofers. Each channel shall be assigned to the closest input panel.
 - d. Each output channel shall have, as a minimum, EQ, Delay, and Limiter. Subwoofer channels shall also incorporate a Shelf.
 - e. Presets shall be saved and password protected.
 - f. The DSP shall be configured to, upon acceptance of a 12-24 volt signal from the alarm system, execute a mute on all input channels.
11. Provide receptacles located throughout the theatre for connection of portable powered loudspeakers both at the pipe grid and at the floor.
 12. Provide a feed to the RF Assistive Listening System.
- E. Control:
1. Provide sound control via an audio mix console and associated equipment including microphone and line level patching located in the Control Booth.
 2. Provide a 32-input Left-Center-Right multi-bus mixing console with 8 group mixes to provide flexibility and control in live mixing situations, additionally, six to eight pre/post effects busses will provide sufficient capabilities for the use of effects or loudspeaker sends.
 3. Foldback mixing for the stage performers can take place at the main control console utilizing one or more of the auxiliary busses or groups, although the system can be set up with separate isolated foldback available on-stage.
- F. Playback and routing :
1. Provide local interconnectivity of audio, video and data with the use of tie-line panels in the performance area that terminate to an audio, video, or RJ-45 data patch bay in the control booth.
 2. The control booth shall serve as the hub for all audio, video, and CAT-6 cabling in each theatre.
 3. Provide a tieline panels in several key locations as shown in the drawings to provide access for signal connectivity within the facility. Panel to include audio, video, intercom and CAT-6, all terminating to signal appropriate patch panels within the control room.
 4. Provide patchable CAT-6 cable balanced/unbalanced converters (baluns) in the control booth racks, so that analog audio or video signals can be sent or received to or from the control booth over CAT-6 type cabling. Provide matching CAT-6 baluns for use outside the control booth.
 5. Provide audio and video signal distribution and routing capabilities through the use of rack-mounted audio and video distribution amplifiers, routing switchers, and patch panels.
 6. Provide rack-mounted video and audio monitoring capabilities in the control room.
- G. Production Intercom System:
1. Provide multi-channel technical intercom system to allow wired communications between technical locations, technical offices, and front of house locations during pre-show, show, and intermission activities.
 2. Provide belt pack units as well as in-wall units for use by house staff. Provide intercom input plates at the catwalks, around the house and stage areas.
 3. Provide intercom speaker stations with handsets at the office, entry vestibules, and box office.
 4. Intercom shall be both wired and wireless.

H. Assistive Listening System:

1. Provide RF wireless assistive listening system (ALS) to accommodate individuals with hearing impairments, and to comply with the Americans with Disabilities Act (ADA).
2. System consists of individual of headset receivers that can be used anywhere in the seating area of the theaters, and surface-mounted emitter panels located high and above the seating areas on or near the front walls, free of obstructions to allow maximum signal coverage
3. System shall incorporate T-coil loop receivers in the quantities indicated in the schedule or as required by code.

I. Distributed video playback

1. Provide system as shown to route via the matrix video signals from the patchbay which may consist of any source device inserted into any field panel.
2. Portable rack containing video playback kit including computers and video switching gear as shown in the drawings and equipment list.

1.5 SHOP DRAWING SUBMITTALS

A. General: Submit the following in accordance with the Conditions of Contract and Division 1 Specification Section.

B. Prior to Fabrication - Submittal 1:

1. Panels, plates, and designation strips, including details and samples relating to terminology, engraving, finish and color.
2. Custom designed consoles, tables, carts, support bases, and shelves.
3. Schematic drawings of custom circuitry.
4. Unusual equipment modifications.
5. Preliminary layouts of all remote control devices (touch panels, remote controls, etc.), submitted on disk and hardcopy.
 - a. Touch Panel layouts must be done in software supplied by control system manufacturer, such as VisionTools Pro-e. AutoCAD or similar graphics file formats are not acceptable.
6. Descriptions of each button with functionality. Buttons with "trivial" functions, such as help buttons, may be omitted.
7. For each piece of equipment, lists of functions under control of the remote control system.
8. For each piece of equipment, a list of all inputs (feedback) to the remote control system.
9. A list of all equipment in the remote control system.

C. Prior to Assembly and Installation - Submittal 2:

1. System functional block drawings: For video, audio, and control systems, include equipment names and model numbers (e.g., "Program Amplifier - Crown CT-400").

- Clearly label each item of equipment shown on the drawing with the manufacturer's terminal number or input/output designation (e.g., "Mic 1 In", or "Record Out Left").
2. Equipment rack and patch panel assignment drawings: Provide scaled equipment rack elevations and full scale patch bay drawings with proposed labeling. Labeling on the functional diagrams, rack elevations, patch panels and on the equipment controls shall be consistent and uniform.
 3. Provide full-scale drawings of custom plates and panels indicating exact lettering, critical dimensions, and finish.
 4. Run sheets or field wiring drawings: Clearly show at each terminal point the type of connector to be used and include typical wiring details of each connector. Note where shields are connected and where they will float to ensure the integrity of the grounding system. Call out wire types and color codes where appropriate. Assign wire numbers and patchbay locations to every wire and patch point in the drawing.
 5. Equipment modification drawings: Include details of modifications that change or void manufacturer warranties.
 6. Final schematic drawings of custom circuitry: Include receptacle pin numbers and component callouts. Show details of custom resistive combining networks, filters, or pads that may be required in the assembly. Show point-to-point wiring drawings for control system modules and interfaces and for switches and relays in audio, video, or control systems.
 7. Test Equipment: Provide a list of test equipment, including manufacturer, description, and model number, of equipment that is expected to be employed in the test and adjustment of the systems specified.

D. At the Completion of the Installation - Submittal 3:

1. Notification: Provide written notification to the City of New York and General Contractor when initial checkout is complete, normal settings are documented, as-built and operational documentation are complete, and systems are available for final acceptance tests.
2. Submit equipment manufacturer's operation and maintenance manuals for each piece of equipment.
3. Submit "as-built" drawings for systems and items indicated as "Custom".
4. Submit a copy of control system programming, including touch screen layouts, in electronic form and one print-out hardcopy of the complete control system program.
5. Submit System Operation and Maintenance Manual:
 - a. Describe in the "Operation" section, typical procedures necessary to activate each system to provide for the functional requirements as listed under the System Description. Include normal settings for equalizer, amplifier, signal processing, and user-operated controls (as established during system check-out) in tabular or pictorial form.
 - 1) Provide in the "Maintenance" section, a recommended maintenance schedule with reference to the applicable pages in the manufacturer's maintenance manuals. Where inadequate information is provided by the manufacturer, provide the information necessary for proper maintenance.
 - 2) List of Replacement Parts: Provide a list of necessary and recommended replacement parts for a normal maintenance period of one year.
 - 3) Assume the reader of this manual to be technically competent, but unfamiliar with this particular facility. It is estimated that this manual should require a minimum of 25 pages.
6. System Software: Provide copy of control system software program printout and 3-1/2" diskettes containing source code and comments.

1.6 PERFORMANCE STANDARDS

- A. Meet the following performance standards with each system, unless restricted by the published specifications of a particular piece of equipment:
- B. Audio Signal:
1. Signal-to-Noise Ratio (including crosstalk): 55 dB minimum.
 2. Total Harmonic Distortion: 0.1% maximum from 20 Hz to 20,000 Hz.
 3. Frequency Response: +/- 1.0 dB, 20 Hz to 20,000 Hz.
- C. Audio Reproduction:
1. Signal-to-Noise Ratio (including crosstalk): 55 dB minimum.
 2. Total Harmonic Distortion: 1% maximum from 30 Hz to 15,000 Hz.
 3. Frequency Response:
 - a. Distributed Speech Reinforcement System with 8" diameter loudspeakers: +/- 1.5 dB, a flat response from 125 Hz to 2.5 Hz, rolling off at 6 dB/octave from 125 Hz to 80 Hz, 18 dB/octave below 80 Hz, and at 2 dB/octave above 2.5 kHz, as measured on axis of loudspeakers.
 - b. Program Reproduction System Loudspeakers: +/- 2 dB, a flat response from 63 Hz to 6 kHz, decreasing uniformly from a relative level of 0 dB at 6 kHz to a relative level of -5 dB at 20 kHz as measured on axis of loudspeakers.
 4. Sound Output Capability: Provide program levels of not less than 95 dB and speech reinforcement levels of not less than 85dB in the seating area without objectionable distortion, rattles, or buzzes, employing as test signals several different samples of recorded music and microphones applied at each system input.
 5. Hum and Noise: Hum and noise shall be inaudible (below the background noise level of the space) under normal operation and as observed in normal seat locations.
- D. Video Signal:
1. Signal-to-Noise Ratio (peak to RMS) Unweighted DC to 4.2 MHz: 55 dB minimum
 2. Crosstalk: Crosstalk (unweighted DC to 4.2 MHz): 45 dB minimum
 3. Frequency Response: Within plus-or-minus 0.5 dB to 4.2 MHz.
 4. Line and Field Tilt: 2% minimum
 5. Differential Gain: 3% maximum
 6. Differential Phase: 2° maximum
- E. Video Timing:
1. System Timing: Sync coincidence within 50 nanoseconds
 2. Color Timing: Within 2° at 3.58 MHz
- F. Optical: Optical projection systems shall meet the following performance standards:
1. The total averaged light output from a projector, in lumens, shall be within plus-or-minus 15% of that specified by the projector manufacturer.
 2. The light fall-off from the center of the projected image to four corners, as measured at the projected image plane, shall not exceed 50% for video projector images nor 35% for slide projector images.
 3. Projectors, lenses, and mirrors shall be solidly mounted and braced so that there will be no observable movement in the image induced by motor vibration or other mechanical operations.

G. Control:

1. Verify functional operation for specified control operations.
2. Illuminated feedback of the active function via illuminated or shaded pushbutton at operator and wired remote control stations.
3. Wireless systems shall neither be the source of, nor be affected by, radio-frequency interference to/from external signal devices.
4. Ensure that ergonomic parameters are taken into account when designing the human interface to the control system. Be aware that the level of technical inclination will vary between users. The following guidelines should be followed:
 - a. Graphics:
 - 1) Avoid abbreviations
 - 2) Size lettering at 1/8" minimum
 - 3) Maintain background to lettering contrast
 - b. Positive logic: Avoid conditions that may cause command synchronization conflicts (i.e., alternate action (toggling) on/off without power reset or feedback. Provide power sensors or other devices where necessary to ensure that positive logic conditions are maintained.
 - c. Timing: Avoid the possibility for two or more serial macros or actions being sent simultaneously to the same piece of equipment through flag checking/setting routines.
 - d. Linking: Provide linking of functions to require the fewest number of user actions to effectively control the equipment.
 - e. Clearing: Ensure that each media selection clears the previous audio and visual selection (i.e. Slide "ON" clears the audio as well as video section of "VHS" SELECT".
 - f. Defaults: Establish default conditions for the system at power-up including device audio levels, warm-up routine, power conditions, switcher status and other default conditions as required by the City of New York or City of New York's representative.
 - g. Volume Memory: Provide easy-to-use memory for volume settings associated with each particular source device. They shall be maintained between alternate selections during each segment of the power-up condition.
 - h. Status Indication: Buttons (hard and soft) which incorporate pilot light or inverted illumination capabilities shall be addressed through the software and programming.
 - i. Failsafe: No operation or sequence of operations shall cause the control system to become inoperable or interfere with further procession, correct operations or execution of commands.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Bear costs of shipping to the site, and of unusual storage requirements. Make appropriate arrangements, and coordinate with authorized personnel at the site, for the proper acceptance, handling, protection, and storage of equipment so delivered.

1.8 WARRANTY

- A. Warranty the entire system for a minimum of one year from the date of system acceptance by the City of New York. Component warranties shall be honored for the term established by the manufacturer, if greater than one year. Include in the warranty quarterly site visits to check and adjust equipment and restore systems to original performance standards.

- B. Activate manufacturer's equipment warranties in City of New York's name to commence on the date of acceptance.

PART 2 - PRODUCTS

2.1 SUPPLIER/INSTALLERS

A. General Qualifications:

1. Firm has been in business providing similar service for not less than three years.
2. Firm can outline the general scope of past projects, normal staffing levels, and union status of shop and field installation personnel.
3. Firm can list projects of similar scope successfully completed, indicating the location, type of system installed, total contract amount, date completed, and include persons and telephone number to contact.
4. Firm can submit confirmation of current state or local contracting licenses, as required to perform the work under this section.

2.2 EQUIPMENT

- A. Provide equipment as specified in the Equipment Schedule.
- B. To ensure that the latest technology equipment is provided to the project, at the time of installation supply the latest model of the product which is available for each piece of equipment,
- C. Should there be a difference in pricing between the equipment model cost at the time of bid and the pricing for the latest equipment model to be provided at the time of installation, the price differential will be compensated accordingly.
- D. Materials: Supply materials and equipment that shall be new and shall meet or exceed the latest published specifications of the manufacturer.

2.3 CUSTOM FABRICATION

- A. Electrical Power Connections: Electrical power junction boxes and circuits will be provided by others. Provide required interconnections to the power system from these junction boxes to the equipment and equipment racks.
- B. Remote Control Panels and Receptacle Plates. Fabricate with 1/8 inch thick #6061-T6 aluminum material. Finish brushed with 150 grit paper. Anodized finish to be approved by the General Contractor.
- C. Equipment Rack: Provide power receptacle strips, with "U" ground outlets. Power receptacle strips shall be mounted on the rear interior of the rack space on the left side as viewed from the rear. Insulate power receptacle strips from the rack. Power receptacle strips shall be SGL Waber Company or approved equal. Provide UL-approved incandescent work light mounted on the upper left interior panel of each equipment rack.
- D. Project Information Label: Permanently mount, at the top facing edge of each equipment rack, an engraved plastic laminate plate, with filled lettering on contrasting background. Plate shall identify consultant and contractor.

- E. Audio Transformers: Provide appropriate impedance ratio and power handling capacity for the function intended of audio transformers specified in the system.
- F. Networks and Pads: Provide networks and pads as shown on the drawings or as required to achieve proper impedance matching and levels. Networks and pads shall be balanced. 0.5 watt, 5% composition resistors shall be soldered to fixed connection points at each end.
- G. Loudspeaker Enclosures: Loosely fill with glass fiber to 2 lbs/cu. ft. density prior to installing loudspeakers.
- H. Labeling: Provide permanently mounted 1/32" thick by 1/4" high black lamicaid or anodized, brushed aluminum labels with 1/8" engraved lettering for each piece of equipment and every user-adjustable control and input on the audiovisual equipment.
- I. Rack Mount Adapters and Security Covers: Provide the appropriate factory or custom rack mount adapters for equipment installed in the audiovisual equipment rack, whether specifically itemized or not. Provide security covers for equalizers, crossovers, signal delays, and other adjustable signal processors.
- J. System Functional Diagrams: Provide reduced-size as-built functional diagram for the control, audio and video system. Frame with acrylic cover, or laminate drawing, and mount adjacent to equipment rack.
- K. Seismic Safety: Mount and brace permanently installed equipment to the building structure to minimize potential damage to personnel or equipment from foreseeable seismic events. Physically bolt audiovisual equipment racks to the floor to prevent toppling. Brace hanging equipment such as loudspeakers, et cetera both to minimize sway and to prevent detachment from the overhead structure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that electrical requirements including junction boxes, floor boxes, ceiling loudspeaker enclosures, empty conduit and power circuits and receptacles are in place as shown on the drawings.

3.2 INSTALLATION

- A. General: Include the delivery, unloading, setting in place, fastening to walls, floors, ceilings, counters, or other structures where required, interconnecting wiring of the system components, equipment alignment and adjustment, and other work, whether or not expressly required, which is necessary to result in complete operational systems.
- B. Physical Installation:
 - 1. Firmly secure equipment in place unless requirements of portability dictate otherwise.
 - 2. Mount permanently and/or provide a mechanical index insuring precise alignment of the projected image of optical projectors.
 - 3. Provide adequate support for fastenings and supports with a safety load factor of at least three.
 - 4. Secure plumb and square boxes, equipment, etc.
 - 5. Give consideration, not only to operational efficiency, but also to overall aesthetic factors in the installation of equipment and cable.

C. Cable Installation:

1. Mark cables, regardless of length, with permanent, non-handwritten number or letter cable markers within six inches of both ends. There shall be no unmarked cables in the system. Marking codes used on cables shall correspond to codes shown on drawings and/or run sheets.
2. Furnish screw-type terminal blocks, boards, strips, or connectors, for cables which interface with racks, cabinets, consoles, or equipment modules. Terminate wires terminating at screw-type terminals with crimp-on lugs. "Telephone-style" punch-down blocks are not acceptable for signal or data wiring.
3. Group cables according to the signals being carried. In order to reduce signal contamination, form separate groups for the following cables:
 - a. Power cables
 - b. Control cables
 - c. Video cables
 - d. Camera cables
 - e. Audio cables carrying signals less than minus 20 dBm.
 - f. Audio cables carrying signals between minus 20 dBm and plus 30 dBm.
 - g. Audio cables carrying signals above plus 30 dBm.
 - h. Broadband RF cables.
 - i. CAT-5/6 Data Cables
 - j. Fiber cables may be grouped with any of the other cable types.
4. As a general practice, run power cables, control cables, and high level cables on the left side of an equipment rack as viewed from the rear. Run other cables on the right side of an equipment rack, as viewed from the rear.
5. Unless otherwise called for in these specifications and drawings, use the following cables, or their approved equals, in these systems:
 - a. Multi-mic Cable for stage Multi-Mic panels and stage snake boxes: Canare Star-Quad
 - b. Multi-Channel cable for portable console/rack systems: Canare MR202-32AT
 - c. Video cable for runs not exceeding 200 feet between active devices: Belden 8279
 - d. Video cable for runs exceeding 200 feet between active devices: Belden 8281
 - e. Plenum-rated video cable: Belden 88281
 - f. Microphone and line-level audio cable in conduit: Belden 1800B
 - g. Microphone and line-level audio cable for rack wiring: Belden 8761
 - h. Low-impedance speaker cable: Belden 8473
 - i. 70-volt speaker cable: Belden 8461
 - j. Plenum-rated 70-volt speaker cable: Belden 89740
 - k. RF cable for major vertical trunk runs: Jerrold CAC-6
 - l. RF cable for horizontal runs and outlet connections: Jerrold CAC-11
 - m. RF cable for head-end rack connections: CommScope F59-HEC
 - n. Camera cable: Belden 9232
 - o. Control cable: Belden 9740, 9156, 8690, 9157, 9159, 8691, 9161
 - p. Plenum-rated control cable: Belden 89740, 82489
 - q. CAT-6 Cable see telecommunications specification
6. Cut cables (except video, camera and RGSB cables that must be cut to an electrical length) to the length dictated by the run. For equipment mounted in drawers or on slides, provide the interconnecting cables with a service loop of appropriate length.
7. Install no cable with a bend radius less than that recommended by the cable manufacturer.
8. Clearly identify cable terminated in a floor pocket with permanent, indelible labels within 6" of the cable connector. Provide strain relief for cables. Provide connectors with metal

- shell/casing. Provide a minimum of 3' of free cable coiled in the floor pocket. Use spiral wrap to group similar cable types.
9. Use plenum-rated cable in plenum-rated spaces. Where plenum-rated cable is used, provide plenum-rated and approved tie-wraps and supports (Thomas & Betts #TYV525M, or approved equal).
- D. Receptacle Plate Connectors:
1. Unless otherwise detailed herein, use the following types of panel receptacles on connection boxes, panels, plates, and wireways:
 - a. Audio (microphone): XLR (female) type, with locking tab, such as Switchcraft Y3FD.
 - b. Audio input/output (line-level): 1/4 inch diameter tip/ring/sleeve type. Insulate from panel.
 - c. Audio (loudspeaker level): Neutrik Speak-on type. Insulate from panel.
 - d. Intercom: XLR-3 (male) type.
 - e. Video: BNC type. Insulate from panel.
 - f. RF: F type. Insulate from panel.
 - g. Camera: Triax or multi-pin bulkhead type. Insulate from panel.
 - h. Wired Remote Control (multiplex signal): XLR-6 (female) type.
 - i. Wired Remote Control (relay contacts): Neutrik Neutricon.
 2. Receptacle Plate Designation: Clearly engrave wall-mounted receptacle plates with alphanumeric identification of input type (i.e., mic, line, speaker, video etc) and corresponding audio or video patch field designation.
- E. Patch Panel Assignments: Wire patch panels so that signal "sources" (outputs from) appear on the upper row of a row pair; and "loads" (inputs to) appear on the lower row of a row pair.
- F. Patch Panel Designation Strips: Utilize alphanumeric identifications and descriptive information on audio and video patch panel designation strips. Number the jack positions in each horizontal row sequentially from left to right. Letter the horizontal jack rows sequentially from top to bottom. Include the alphanumeric identification of each jack on the functional block drawings, as well as on reproductions of these drawings which shall be mounted in an appropriate location near the patch bays.
- G. Grounding Procedures: In order to minimize problems resulting from improper grounding, and to achieve maximum signal-to-noise ratios, adhere to the following grounding procedures:
1. General: Because of the great number of possible variations in grounding systems, follow good engineering practice, as outlined above, and deviate from these practices only when necessary to minimize crosstalk and to maximize signal-to-noise ratios in the audio, video, and control systems.
 2. System Grounds: Establish a single primary "system ground" for the systems in each particular area. Connect grounding conductors in that area to this primary system ground. Provide the system ground in the audio equipment rack for the area. The ground shall consist of a copper bar of sufficient size to accommodate secondary ground conductors.
 3. Rack Ground:
 - a. Connect the No.6 insulated copper wire connected to the earth ground to the primary system ground busbar in the Equipment Rack.
 - b. Bond a No.12 TW stranded wire from the Equipment Rack frame to the primary system ground bus bar.

4. Equipment Grounds: Grounding methods used will be dependent upon individual equipment interconnection of chassis ground, circuit common, and power supply common within the units. Provide ground method for equipment types as follows:
 - a. Equipment having a 3-wire power cord with green wire of the power cord connected to chassis (Signal common is not internally connected to chassis): Make no connection from chassis ground to primary systems ground busbar in Equipment Rack.
 - b. Equipment having a 3-wire power cord with green wire of the power cord connected to chassis: Make no connection from chassis ground to primary system busbar, but do make connection with 14AWG insulated wire from circuit common to primary system ground busbar in Equipment Rack. Separate circuit common from chassis ground.
 - c. Equipment having a 2-wire power cord, no green wire, neutral is not tied to chassis, and circuit common is tied to chassis: Make connection from chassis to primary system ground busbar using 14AWG insulated wire.
5. Audio Cable Shields: Ground audio cable shields at one point only. There are no exceptions. For inter- and intra-rack wiring connect the shield at one end only, this shall be at the input to a device. The shield shall be lifted at the device output. For ungrounded portable equipment, such as microphones, the shield shall be connected at both ends but grounded at only one end.
6. Video Receptacles: Insulate video receptacles from the panel, outlet box, or wireway. Unless otherwise detailed herein, use insulated-from-panel type receptacles.

3.3 FIELD QUALITY CONTROL

- A. Initial Tests and Measurements: Before final adjusting and acceptance tests are scheduled, perform system checkout. Furnish required test equipment and perform work necessary to determine and/or modify performance of the system to meet the requirements of this specification. Include the following:
 1. Test audio, video, RF, optical, and remote control systems for compliance with the functional requirements and Performance Standards.
 2. Adjust, balance, and align equipment for optimum quality and to meet the manufacturer's published specifications.
 3. Prepare and maintain documentation of performance tests, including numerical values of established equipment settings, for reference during the System Acceptance Tests. Submit final results prior to scheduling Final Acceptance Tests Manual.
 4. Install 1/8" diameter vinyl "map dots" as indicators for nominal operating positions of rotary, slider, or switch controls available for operator adjustment. Provide multiple indicators, adequately distinguished, for controls having more than one nominal operating position.
 5. Follow Electronic Industries Association Standards RS 219 and RS 160 in performing these tests.
- B. Audio System:
 1. Loudspeaker-Line Impedance: Measure the impedance at 250 Hz, 1 kHz, and 4 kHz and the resistance of each loudspeaker line leaving the sound equipment rack with the line disconnected from its normal driving source. For lines to full-range distributed loudspeaker systems, measure the magnitude of impedance at 1 kHz.
 2. Hum and Noise Level:
 - a. Measure the hum and noise levels of the overall system for each microphone input channel and line-level input channel.

- b. Adjust gain controls for optimum signal-to-noise ratio so that full amplifier output will be achieved with 0 dBm at a line-level input.
 - c. Terminate line-level inputs with shielded resistors of 150 and 600 ohms, respectively, for these measurements.
 - d. Disconnect the loudspeaker lines and terminate the power-amplifier outputs with power resistors for these measurements. The value of the load resistor shall be within 5% of the nominal load impedance of the amplifier under test. The power rating of the resistor shall equal the power rating of the amplifier.
3. Frequency Response of the System:
 - a. Measure the frequency response using the audio systems as described in Part 1. Adjust gain controls and equalizers to provide the octave-band sound levels as specified.
 - b. Programmable Equalizers: Provide necessary controller with full audio spectrum display for the adjustment of programmable equalizers during system checkout. Do not provide equalizer programmers with the systems.
4. Uniformity of Coverage: Measure octave band of pink noise test signal, centered at 4 kHz, played through loudspeaker system.
5. Power-Output and Signal-Level Adjustment within System:
 - a. Measure the electrical distortion of the overall system for each line-level input channel.
 - b. Adjust gain control as for the tests specified herein.
 - c. Apply a 1-kHz sine-wave signal from an oscillator having less than 0.5% total harmonic distortion at the input tested, at a level required to produce full amplifier output. Note that a pad with 150-ohm output impedance is required for driving the microphone-level input in accordance with the EIA standard.
 - d. Use a distortion analyzer to measure the output level and the total harmonic distortion of the amplification and control equipment. In the absence of a distortion analyzer, a high input impedance-measuring device such as a DMM may be used to measure the output level. Lack of clipping or apparent deformation of a sine-wave input signal at the power-amplifier output, as seen on the oscilloscope, may serve as evidence that distortion of amplification and control equipment is within acceptable limits.
 - e. Make measurements with loads actually incurred in the system operation. Power-amplifier loads shall be power resistors equal to the nominal load impedance of the output terminals used in the system.
6. Loudspeaker Polarity
 - a. Perform polarity checks of loudspeaker lines by means of a polarity tester or use DC source at one end of each line and a voltmeter at the other end. Loudspeaker lines shall be identically polarized with respect to color-coding.
 - b. Test polarity of the loudspeakers using a sine-wave test signal warbled about 500 Hz. The listener shall be located on axis of the loudspeaker. Switch the loudspeakers from nominally in polarity to nominally out of polarity with respect to the selected loudspeaker. With the loudspeakers in proper polarity, the quality and clarity of the music or speech should be greater, and the warble test signal should clearly come to the surrounding space from the loudspeaker.
7. Freedom From Parasitic Oscillation and Radio-Frequency Pickup:
 - a. With systems set up for each mode of operation specified in the functional requirements, check to ensure that systems are free from spurious oscillation and

radio-frequency pickup, in the absence of audio input signal and when the system is driven to full output at 100 Hz.

- b. Employ an oscilloscope having at least 5 MHz bandwidth for these checks.
 - c. Apply slow sine-wave sweep from 50 Hz to 5 kHz at a level of 6 dB below rated power-amplifier output voltage to each system. Listen carefully for buzzes, rattles and objectionable distortion.
 - d. Correct causes of these defects unless the cause is clearly from other than the sound amplification system's equipment and installation, in which case bring the cause to the attention of the General Contractor.
8. Audio Test Signal Paths: Verify operation from source inputs (for microphones, audio tape units, video tape units, etc.) through ADAs, mixers, switchers, etc., to signal destinations.
- C. Video System:
1. Input Signal Level: Measure standard composite signal level to be 1.0 volt peak-to-peak with oscilloscope, across standard input impedance.
 2. Signal-to-Noise: Operate system at standard input and output levels. Terminate with standard load impedance. Measure noise level using oscilloscope for signals from 10 kHz to 4.2 MHz and an RMS volt-meter for signals from 0 to 10 kHz, and calculate signal-to-noise ratio.
 3. Differential Gain: Using a step generator and waveform monitor measure chrominance, luminance, and normal synchronizing and blanking signals. Measure variation in amplitude of the chroma sub-carrier at 10%, 50%, and 90% luminance.
 4. Differential Phase: Operate system as defined above and measure variation in phase of the chroma sub-carrier at 10%, 50%, and 90% luminance.
- D. Optical System:
1. The light intensity shall be measured at five positions of the projected image (center and four corners) after the projector has been adjusted to provide the light output as specified above.
 2. The "corner" locations shall be defined as the four points determined by intersecting lines drawn 5% of the distance in from the focused edges of the image.
 3. The light meter used for the above measurements shall be a properly calibrated footcandle (or lux) meter and shall be cosine-corrected.
- E. Control System:
1. Verify operational functions at each control receptacle position.
 2. Verify operational functions of wireless control device.
 3. Verify operational functions of the control system and interfaced devices.

3.4 TRAINING

- A. Provide on the job training by a suitably qualified instructor, to designated personnel, to instruct them in the operation and maintenance of the systems.
- B. Arrange with the equipment manufacturer for such instruction, at no additional cost, in the event qualified instructors are not available on staff for certain sophisticated equipment.
- C. Schedule the first training after the systems are operational. Provide a minimum of (3) three, 4-hour training sessions (12 hours of training total) on the systems included in this specification.

3.5 SYSTEM ACCEPTANCE TESTS

- A. System acceptance tests shall not be performed until the initial system checkout and the initial testing and tuning report has been completed by the Contractor. The system acceptance tests consist of the following:
1. Take a physical inventory of equipment on site and compare to equipment lists in the contract documents.
 2. Demonstrate the operation of system equipment.
 3. Both subjective and objective tests will be required to determine compliance with the specifications. Provide test equipment specified for these tests.
 4. Provide final, "as-built" drawings, run sheets, manuals, and other required documents, as detailed in Part 1.
- B. In the event further adjustment is required, or defective equipment must be repaired or replaced, tests may be suspended or continued at the option of the Owner.
1. If the need for further adjustments becomes evident during the demonstration and testing, continue work until the installation operates properly. Included in the continued work shall include, but not be limited to, changes to or installation of resistive pads, readjustment of loudspeaker aiming, adjustment of system equalizers, programming changes to the control system, convergence of the video projector, if these adjustments are required.
 2. If acceptance of the system is delayed because of defective equipment or because the equipment does not fulfill this specification, reimburse the Owner for time and expenses for these tests during extensions of the acceptance-testing period.

3.6 CLEANUP AND REPAIR

- A. Upon completion of the work, remove refuse and rubbish from and about the premises, and shall leave the relevant areas and equipment clean and in an operational state. Repair damage caused to the premises by the installation activities, at no cost to the Owner.

3.7 PROTECTION OF WORK

- A. During the installation, and up to the date of final acceptance, protect finished and unfinished work against damage and loss. In the event of such damage or loss, replace or repair such work at no cost to the Owner.

3.8 SCHEDULE OF EQUIPMENT

Provide separate pricing for the supply and installation of equipment using the breakdowns provided below:

BUILDING WIDE

Qty.	Equipment	Basis of Design Manufacturer	Model -	Notes
Signal Distribution and Routing				
lot	Plates and Panels	Custom—see drawings		
Assisted Listening Systems (Building Wide)				
2	FM transmitter	Listen Technologies	LT-800-072	
2	Rack mount kit	Listen Technologies	LA-326	
2	Antenna	Listen Technologies	LA-122	
10	Assisted listening headphones	Listen Technologies	LA-165	
6	Assisted listening neck loop	Listen Technologies	LA-166	
10	FM receivers	Listen Technologies	LA-300	
1	Assisted listening charging case	Listen Technologies	LA-311	
Paging and Show Relay (Building Wide)				
33	Ceiling loudspeakers	JBL	Control 24CT Micro plus	(White)
7	Wall mounted loudspeakers (control booths)	JBL	Control 23T	Black
5	Ceiling loudspeakers (Theatre 2 lobby)	JBL	Control 23T	(White)
4	Loudspeaker yoke assembly	Custom	Custom Mount	For pipe grid for above loudspeakers
12	Volume control	Atlas	AT100D	
1	70v amplifier	QSC	CX 108	8 channel 70V
1	Audio paging processor	Rane	HAL1	
1	Audio paging expansion	Rane	EXP1	
3	Zone selectors	Rane	DR2	
5	Paging stations	Rane	Pager 1	
2	Paging microphones	Clear Com	110/100	
3	Paging microphones	Clear Com	110/340	
2	Show relay microphone	Audio Technica	BP4073	
2	Mounting clamp for mic onto light rail	Custom	Custom	Allowance
Video Show Relay (Building Wide)				
5	Digital signage box	Convergent	HMP130	2 for outdoor displays location TBD
3	TVs, public areas	NEC	P551-AVT	55" display
6	TV Mounts	Peerless		
3	TVs, back of house	NEC	E322	32" display ART office control rooms

THEATRE 1

Qty.	Equipment	Basis of Design Manufacturer	Model	Notes
Tech Intercom				
1	Master station wireless	Clear Com	Tempest 900	
1	Master station wired (4 channel)	Clear Com	MS-704	
3	Wall Plate	Clear Com	KB702 GM	
3	Gooseneck microphone	Clear Com	GM-18	
5	Beltpacks (wireless)	Clear Com	Tempest CP942	
8	Beltpacks (wired)	Clear Com	RS-603	
8	Headsets	Clear Com	CC-95	
4	Headsets	Clear Com	CC-26K	
8	Adapter	Clear Com	YC36	
12	3 pin M XLR to 3 pin F XLR		50'	
1	5 bay battery charger	Clear Com	T-BC5A	
1	Remote antenna transceiver	Clear Com	CCT-9RT	
Data and AV Network				
4	24 port Cat 6 switch 48 gbp/s	BBS	GS724T	
36	Cat 6 patch cables			
2	Cat 6 patchbay 48 port	Hubbell	MCC580611 0A19	
Reinforce Playback				
6	2 x 24 audio patch bay	Bitree	489 programmable	
50	Audio patchcord		3 foot patchcord TT	
1	DSP processor	Yamaha	DME64	
2	DSP processor cards	Yamaha	ADDA 96	
2	DSP processor cards	Yamaha	MY16-ES64 & MY16-EX	
2	37 space equipment rack	Middle Atlantic	AXS series	
lot	Rack accessories-sides, top back etc.		Per rack	
9	1RU rack vents	Middle Atlantic	VT1	
2	2RU rack vents	Middle Atlantic	VT2	
1	Portable rack with covers	SKB	(10ru) 1SKB19-10U	
1	Brush Grommet Panel	Middle Atlantic	BR1	
3	Rack mount drawer	Middle Atlantic	UD4 (4ru)	
1	Rack mount drawer	Middle Atlantic	UD2 (2ru)	
1	Half height rack on casters	SKB	Roto Gig Rig (10ru)	
5	Power conditioner	Furman	PL-Pro DMC	
1	Scaler composite to component	Extron	USP 507	For show relay camera
1	IR camera	Bosch	WZ20	
1	Video matrix switcher	Extron	MAV Plus 1616HD	
5	Video patchbay	Canare	32MD-ST-2U-SB 2X32	
24	Video patchcords			12 pack

Qty.	Equipment	Basis of Design Manufacturer	Model	Notes
1	Monitor camera	Vaddio	Clear View HD19	
2	Rack mount monitor	Marshall	V-R102DP-HDA	
1	Wireless mic antenna	Shure	UA870	
4	Cable for wireless mic antenna	Shure	UA8100	12 foot cable
1	Clamp for wireless mic antenna	Custom	Custom	
2	CD/MP3/CDR	Denon	DN-C635	
2	Microphones	AKG	414	
2	Microphones	AKG	D112	
4	Microphones	Shure	SM57 handheld	
4	Microphones	Shure	SM58 handheld	
5	Mic Stands	Atlas	MS20E	
5	Mic Stands	Atlas	TEB-E	
12	Mic Clips for stands			
10	Cable M XLR to F XLR mic/line		2'-0"	
15	Cable M XLR to F XLR mic/line		5'-0"	
20	Cable M XLR to F XLR mic/line		15'-0"	
25	Cable M XLR to F XLR mic/line		25'-0"	
20	Cable M XLR to F XLR mic/line		50'-0"	
10	Cable M XLR to F XLR mic/line		75'-0"	
10	Cable M XLR to F XLR mic/line		100'-0"	
1	Mass connector to XLR fan out cable (32)	Whirlwind	MASS 15'-0"	
1	Mass connector to XLR fan out cable (16)	Whirlwind	MASS 15'-0"	
2	Mass connector to Mass connector	Whirlwind	MASS 50'-0"	
2	MASS to MASS jumper input cable (32)	Whirlwind	MASS 50'-0"	
2	MASS to MASS jumper output cable (16)	Whirlwind	MASS 50'-0"	
1	MASS to stage box 24 send 8 return	Whirlwind	Medusa series 25'-0"	
10	CAT6 cables		10'-0" SJO Jacket	
10	CAT6 cables		25'-0" SJO Jacket	
5	CAT6 cables		50'-0" SJO Jacket	
10	Extension Cord (black)		10'-0"	
10	Extension Cord (black)		25'-0"	
10	Extension Cord (black)		50'-0"	
10	Extension Cord (black)		100'-0"	
8	Loudspeakers	Meyer	UP Juniors	
2	Loudspeakers	Meyer	UPJ-1P	
2	Loudspeakers	Meyer	UM-100P	
2	Subwoofers	Meyer	UMS-1P	
4	Speaker stands	Atlas	SS500E	

Qty.	Equipment	Basis of Design Manufacturer	Model	Notes
4	Speaker stand adapter plates	Atlas		
10	Yoke assemblies, c-clamps and safety cables for mounting loudspeakers to the pipe grid	Meyer and custom		
2	Self-powered control booth monitors	JBL		
Video Distribution				
2	VGA to Cat 5 transmitter	Extron	VTT001	
2	VGA to Cat 5 receiver	Extron	VTR001	
2	DVI to Cat 5 transmitter	Extron	DVI 201	
2	DVI to Cat 5 receiver	Extron	DVI 201	
6	VGA to RGBHV cable			6 foot cable
4	Cable		VGA to 5xBNC short	
10	Cable		VGA to 5xBNC 25'	
3	Cable		DVI 6'	
3	Cable		VGA 6'	
2	Cable	Extron	5xBNC 25'	
15	Cable		BNC Barrels	
2	Cable		DVI to HDMI	
2	Cable		BNC (SDI) 50'	
2	Cable		BNC (SDI) 25'	
C1 Wireless Mic Kit				
4	Wireless mic receiver	Shure	UR4D	
2	Wireless mic transmitter	Shure	UR1M	
2	Wireless mic transmitter	Shure	UR1	
1	Wireless mic handheld	Shure	UR2-SM58	
1	Wireless mic handheld	Shure	UR2-KSM9 (black)	
1	Wireless mic	Shure	WL93	
2	Wireless mic	Countryman	B2D (black)	
2	Wireless mic	Countryman	B3 (black)	
D1 Video Playback				
1	Portable rack with covers	SKB	(10ru) 1SKB19-10U	
1	Camera	Vaddio	Clearview HD-20 PTZ w Quick connect SR	
1	Camera	Vaddio	ProductionVIEW Super Joystick	
2	Computer	Apple	Mac Mini i7 8GB w/accessories	
2	Rack mount kit	Sonnet	holds 2 mac minis in 1 ru	
1	Computer	Apple	I-Mac 27" 3.1GHz 16GB (Design/Capture)	
2	Software	Figure 53	Q-Lab (Midi, Audio, Video Bundle)	
1	Software	Troika Tronix	Isadora	
1	Software	Apple	Final Cut Studio	Multi user license

Qty.	Equipment	Basis of Design Manufacturer	Model	Notes
1	Software	Adobe	Production Premium (CS6)	
1	Video I/O	AJA	IoHD Capture	
1	Video Multi-Display	Matrox	TripleHead2Go Digital	
1	Video Player	Panasonic	DMP-BDT210 BluRay DVD	
1	Computer	Apple	Mac Mini i5 4GB & Keynote (lobby)	
1	Scaler/Switcher	TVOne	C2-2255A Scaler/Switcher	
1	Scaler/Switcher	TVOne	S2-105CV expansion for C2- 2255A	
1	Scaler/Switcher	TVOne	S2-105PC expansion for C2- 2255A	
E1 Sound Console				
1	Analog Sound Console	Allen and Heath	Mix Wizard 16:2	
1	Multibus mixing console	Yamaha	LS9-32	
2	Processor cards for console	Yamaha	MY16-ES64 & MY16-EX	Ethersound cards
H1 Projector Package				
1	Projection Screen	AV Stumpfl	16' x 9' with front & rear screen	
1	Projection Screen	AV Stumpfl	10' x 7.5' with front & rear screen	
1	Projection Screen	AV Stumpfl	4' 11" x 8' 9" with front & rear screen	
1	Projector	Panasonic	PT-DZ8700U (10000 Lumen 3DLP, WUGXA)	
1	Projector lens	Panasonic	ET-D75LE2 Lens (medium throw)	
1	Projector douser	Wybron	Eclipse IT 1K douser	
1	Projector lens	Panasonic	ET-D75LE6 Lens (short throw)	
1	Projector lens	Panasonic	ET-D75LE5 Lens fixed (very short throw)	
2	Projector lamp	Panasonic	ET LAD310W Lamp - PT-DZ8700U	
1	Projector	Panasonic	PT-DZ6700U (6000 Lumen 3DLP, WUGXA)	
1	Projector case	Panasonic	Padded storage case for PT- DZ6700U	
1	Projector lens	Panasonic	ET-DLE080 Lens (short throw)	
1	Projector lens	Panasonic	ET-DLE250 Lens (medium throw)	
2	Projector lamp	Panasonic	Lamp - PT- DZ6700U	
2	Projector mount	Premier	FTP Rigging Mount	

THEATRE 2

Qty.	Equipment	Basis of Design Manufacturer	Model	Notes
Tech Intercom				
1	Master station wireless	Clear Com	Tempest 900	
1	Master station wired (4 channel)	Clear Com	MS-704	
2	Wall Plate	Clear Com	KB702 GM	
2	Gooseneck microphone	Clear Com	GM-18	
5	Beltpacks (wireless)	Clear Com	Tempest CP942	
8	Beltpacks (wired)	Clear Com	RS-603	
8	Headsets	Clear Com	CC-95	
4	Headsets	Clear Com	CC-26K	
8	Adapter	Clear Com	YC36	
12	3 pin M XLR to 3 pin F XLR		50'	
1	5 bay battery charger	Clear Com	T-BC5A	
1	Remote antenna transceiver	Clear Com	CCT-9RT	
Data and AV Network				
4	24 port Cat 6 switch 48 gbp/s	BBS	GS724T	
36	Cat 6 patch cables			
1	Cat 6 patchbay 48 port	Hubbell	MCC580611 0A19	
Reinforce Playback				
4	2 x 24 audio patch bay	Bitree	489 programmable	
50	Audio patchcord		3 foot patchcord TT	
1	DSP processor	Yamaha	DME64	
2	DSP processor cards	Yamaha	ADDA 96	
2	DSP processor cards	Yamaha	MY16-ES64 & MY16-EX	
1	37 space equipment rack	Middle Atlantic	AXS series	
lot	Rack accessories-sides, top back etc.		Per rack	
1	Portable rack with covers	SKB	(10ru) 1SKB19-10U	
1	Brush Grommet Panel	Middle Atlantic	BR1	
1	Rack mount drawer	Middle Atlantic	UD4 (4ru)	
1	Rack mount drawer	Middle Atlantic	UD2 (2ru)	
1	Half height rack on casters	SKB	Roto Gig Rig (10ru)	
4	Power conditioner	Furman	PL-Pro DMC	
1	Scaler composite to component	Extron	USP 507	
1	IR camera	Bosch	WZ20	
1	Video matrix switcher	Extron	MAV Plus 1616HD	
5	Video patchbay	Canare	32MD-ST-2U-SB	
1	Monitor camera	Vaddio	Clear View HD19	
2	Rack mount monitor	Marshall	V-R102DP-HDA	
2	Wireless mic antenna	Shure	UA870	
4	Cable for wireless mic antenna	Shure	UA8100	12 foot cable

Qty.	Equipment	Basis of Design Manufacturer	Model	Notes
1	Clamp for wireless mic antenna	Custom	Custom	
2	CD/MP3/CDR	Denon	DN-C635	
4	Microphones	Shure	SM57 handheld	
4	Microphones	Shure	SM58 handheld	
5	Mic Stands	Atlas	MS20E	
5	Mic Stands	Atlas	TEB-E	
12	Mic Clips for stands			
10	Cable M XLR to F XLR mic/line		2'-0"	
15	Cable M XLR to F XLR mic/line		5'-0"	
20	Cable M XLR to F XLR mic/line		15'-0"	
25	Cable M XLR to F XLR mic/line		25'-0"	
20	Cable M XLR to F XLR mic/line		50'-0"	
10	Cable M XLR to F XLR mic/line		75'-0"	
10	Cable M XLR to F XLR mic/line		100'-0"	
1	Mass connector to XLR fan out cable (32)	Whirlwind	MASS 15'-0"	
1	Mass connector to XLR fan out cable (16)	Whirlwind	MASS 15'-0"	
2	Mass connector to Mass connector	Whirlwind	MASS 50'-0"	
2	MASS to MASS jumper input cable (32)	Whirlwind	MASS 50'-0"	
2	MASS to MASS jumper output cable (16)	Whirlwind	MASS 50'-0"	
10	CAT6 cables		10'-0" SJO Jacket	
10	CAT6 cables		25'-0" SJO Jacket	
5	CAT6 cables		50'-0" SJO Jacket	
10	Extension Cord (black)		10'-0"	
10	Extension Cord (black)		25'-0"	
10	Extension Cord (black)		50'-0"	
10	Extension Cord (black)		100'-0"	
8	Loudspeakers	Meyer	UP Juniors	
2	Subwoofers	Meyer	UMS-1P	
10	Yoke assemblies, c-clamps and safety cables for mounting loudspeakers to the pipe grid	Meyer and custom		
2	Self-powered control booth monitors	JBL		
Video Distribution				
4	Cable		VGA to 5xBNC short	
10	Cable		VGA to 5xBNC 25'	
2	Cable		DVI 6'	
2	Cable		VGA 6'	
2	Cable	Extron	5xBNC 25'	
15	Cable		BNC Barrels	

Qty.	Equipment	Basis of Design Manufacturer	Model	Notes
2	Cable		DVI to HDMI	
2	Cable		BNC (SDI) 50'	
2	Cable		BNC (SDI) 25'	
C2 Wireless Mic Kit				
4	Wireless mic receiver	Shure	UR4D	
2	Wireless mic transmitter	Shure	UR1M	
2	Wireless mic transmitter	Shure	UR1	
1	Wireless mic handheld	Shure	UR2-SM58	
1	Wireless mic handheld	Shure	UR2-KSM9 (black)	
1	Wireless mic	Shure	WL93	
2	Wireless mic	Countryman	B2D (black)	
2	Wireless mic	Countryman	B3 (black)	
D2 Video Playback				
1	Portable rack with covers	SKB	(10ru) 1SKB19-10U	
2	Computer	Apple	Mac Mini i7 8GB w/accessories	
1	Rack mount kit	Sonnet	holds 2 mac minis in 1 ru	
2	Software	Figure 53	Q-Lab (Midi, Audio, Video Bundle)	
1	Software	Troika Tronix	Isadora	
1	Video Multi-Display	Matrox	TripleHead2Go Digital	
1	Video Player	Panasonic	DMP-BDT210 BluRay DVD	
1	Computer	Apple	Mac Mini i5 4GB & Keynote (lobby)	
1	Scaler/Switcher	TVOne	C2-2255A Scaler/Switcher	
E2 Sound Console				
1	Multibus mixing console	Yamaha	LS9-32	
2	Processor cards for console	Yamaha	MY16-ES64 & MY16- EX	Ethersound cards
H2 Projector Package				
1	Projection Screen	AV Stumpfl	16' x 9' with front & rear screen	
1	Projection Screen	AV Stumpfl	10' x 7.5' with front & rear screen	
1	Projection Screen	AV Stumpfl	4' 11" x 8' 9" with front & rear screen	
2	Projector	Panasonic	PT-DZ8700U (10000 Lumen 3DLP, WUGXA)	
1	Projector case	Panasonic	Padded storage case for PT-DZ6700U	
1	Projector Douser	Wybron	Eclipse IT 1K douser	
2	Projector Lens	Panasonic	ET-DLE080 Lens (short throw)	
1	Projector Lens	Panasonic	ET-DLE250 Lens (medium throw)	
2	Projector Lamp	Panasonic	Lamp - PT-DZ6700U	
2	Projector mount	Premier	FTP Rigging Mount	

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SECTION 28 00 00 – COMMON WORK RESULTS FOR ELECTRONIC SECURITY

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

A. Description

1. Provide an integrated security management system in accordance with the contract documents. The work of this section includes, but is not limited to the following:
 - a. Section 28 10 00: Access Control and Alarm Monitoring System (ACAMS)
 - b. Section 28 20 00: Video Surveillance System (VSS)
 - c. Section 28 30 00: Security Intercommunications System (SIS)
2. The Contractor shall be responsible for providing a complete fully operational turnkey security system as specified within these documents.

B. Applicable Codes and Standards

1. It is not the intent on this document to provide all details of design and fabrication. The Contractor shall insure that the design and fabrication of the equipment is in accordance with applicable engineering codes and standards. When specific requirements are stated in this Section that exceed and/or overlap those requirements of the codes and standards referenced here, this Section shall govern.
2. The Contractor shall be responsible for compliance with all applicable prevailing codes and laws within the jurisdiction of the site as applicable to the extent of this section.
3. The Contractor shall be responsible for all fees associated with the above stated compliance.

C. Definitions

1. Conflicts between these definitions and any other definitions presented within any Contract Document, as well as inquiries about the intent or meaning of definitions, shall be promptly brought to the attention of the City of New York. Should conflicts exist between these definitions and the definitions found in the project General Conditions, the more stringent definition shall govern.
 - a. Base Design/System: The intent of this phrase(s) is to describe the security systems specified herein, without regard or reference to the alternates appended to this document. The base design and base system present minimum acceptable performance levels and the City of New York's desire to provide priority consideration to the most economic security system that meets these performance levels.
 - b. Security Contractor: This term designates the company which conducts the Work and is responsible to ensure that others provide specified Work as described in the Specifications for security systems. This term specifically refers to a company that is qualified to perform the Work specified herein related to the integration of all electronic security access control systems and components and the fabrication and installation of all security equipment. This term shall be interchangeable with "Contractor".

- c. Electrical Contractor: The Electrical Contractor shall furnish and install all security system interconnecting conduits, junction boxes, outlet boxes, electrical troughs, cable ladders, plywood backboard and other associates mounting hardware. Interconnecting security conduits shall be installed with a nylon pull string inside the conduits for installation of interconnecting conductors. In addition, the Electrical Contractor shall install the electrical power (120V) for the security system. The Electrical Contractor shall refer to the electrical drawings and electrical specifications for installation requirements.
- d. Door Hardware Supplier: The Company engaged by the General Contractor to provide materials and services for all door hardware, door frames, and mechanical locking hardware, as defined and described in the Contract between the General Contractor and the City of New York.
- e. Door/Frame Security Hardware Package: This term signifies the security hardware package associated with a security access controlled and/or alarm monitored door. Security door hardware includes an electrified lock, electric strike, electrified panic hardware, electric power transfers or electrified hinges, magnetic door contacts, lock power supplies, termination cabinets, and final connection of wiring to door security devices and to the appropriate screw terminals on the screw-type termination strips located in the termination box.
- f. Demonstration: This term signifies the verification by operation, movement or adjustment of an item or system and the comparison of the item or system performance against a qualitative standard or standards as set forth in the specific requirements of the cited paragraph.
- g. Test: "Test" implies the systematic exercising of an item or system under all specified conditions with quantitative measurement of specified parameters and comparison of performance against the quantitative standards set forth. The Contractor shall pre-test/pre-commission the installed system before the Contracting Officer or his designated representative shall test the system. It is the Contractors responsibility to provide sign-off sheets to the Contracting Officer or his designated representative certifying that the system is ready for testing and commissioning.

D. Responsibilities

- 1. Door Hardware Supplier Responsibilities:
 - a. Shall furnish and install factory-prepared door frame fitted with factory prepared cut-outs and appropriate pre-welded outlet boxes to accept the door security devices.
 - b. Shall furnish and install all non-security mechanical hardware. This shall include but not limited to mechanical hardware, hinges, door closers, door stops, etc.
 - c. Shall furnish all electronic locksets and power transfer hinges to the Security Contractor.
 - d. Shall furnish all local power supply units where required for specific electronic locksets.
- 2. Security Contractor Responsibilities:
 - a. Shall install all magnetic contacts and electronic locksets and power transfer hinges, provided by the door hardware supplier, as specified on the drawings.
 - b. Shall be responsible for coordinating all power and security equipment requirements, including but not limited to, the types and sizes of interconnecting wiring, outlet box sizes, electrical contacts needed and screw terminal sizes with the Electrical Contractor.

- c. Shall furnish and install termination cabinet furnished with screw-type termination block(s). The termination block(s) shall include additional screw terminals to accept the wiring interconnect inputs from the card reader(s), request-to-exit passive infrared detectors and/or the request-to-exit push button switch, and shunt switch, as required, which are not part of the door/frame security hardware package.
3. Electrical Contractor Responsibilities:
 - a. Shall furnish, install and final connect all security door conduits and interconnect wires from door power supply and termination cabinet and/or junction box to all security devices associated with a door/frame security door location.
 - b. Shall furnish and install all other security system interconnecting conduits, junction boxes, outlet boxes, electrical troughs, and other associated mounting hardware. Interconnecting security conduits shall be installed with a nylon pull string inside the conduits for installation of interconnecting conductors.

PART 2 - PRODUCTS

2.1 SYSTEM FUNCTIONS

A. Video Surveillance System (VSS)

1. Provide real-time visual monitoring of spaces and/or objects.
2. Provide recording of activities and/or identifiers (i.e. faces), depending on the positioning and configuration of the camera, for investigative and/or evidentiary purposes.
3. Provide ability to utilize analytics to detect an intrusion or prohibited action (i.e. touching of artwork) and generate an alarm condition.
4. Provide the ability to interface with the Access Control and Alarm Monitoring System (ACAMS) for system integration.

B. Access Control and Alarm Monitoring Subsystem (ACAMS)

1. Provide access control to specified areas through the use of electronic locking devices and credential verification. Authorization to pass through an access point can be either a single means of credential verification or a combination of the following:
 - a. Electronic identification card (card reader);
 - b. Personal identification number (PIN pad / keypad);

C. Badging

1. Badging will be a subsystem of the ACAMS.
2. The badges will serve as both photo identification and an electronic credential.
3. The badges will be categorized into user groups:
 - a. ART-NY Administration Staff
 - b. ART-NY Visitor (renter)
 - c. Contractors
 - d. Temporary Contractor

D. Guard Tour Subsystem (GTS)

1. The GTS will be a subsystem of the ACAMS, utilizing the issued electronic credentials and card readers throughout ART-NY.
2. Provide ability for authorized individual to define a guard tour, or for a guard tour to be automatically generated.
3. Provide ability to generate reports that indicate:
 - a. Individual that conducted the tour;
 - b. Time guard tour started;
 - c. Sequence of checkpoints;
 - d. Time between checkpoints;
 - e. Time guard tour ended;

E. System Interfaces and Integration

1. The following identifies systems that are to communicate with each other to provide a more robust security management system (system1/system2):
 - a. ACAMS/VSS: The ACAMS shall be able to send alarm signals to the VSS for automatic call-up of cameras associated with alarm points, or within the area of the alarm, to a monitor within the security office. The VSS shall also be capable of repositioning a PTZ camera to a pre-defined position that is associated with an alarm point. In addition, if there is a loss of video, an alarm shall be triggered to, and logged by, the ACAMS. The ACAMS shall also escalate the recording rate of the video system to the pre-defined recording level of an alarm condition.
 - b. Fire Alarm System (described in another specification section) – ACAMS: The fire alarm system shall send an alarm condition signal to the ACAMS for logging purposes as well as release electronic locking devices associated with doors within the path of egress or for any other electronically access controlled door required to be unlocked due to code (fail safe doors). Alarm conditions include, but are not limited to:
 - 1) Smoke detection
 - 2) Heat detection
 - 3) Pull station activation
 - 4) Sprinkler flow

F. Description of Work

1. The Security Contractor shall be responsible for the work cited. The Security Contractor shall provide a fully operational turnkey security system as specified in these contract documents. The Security Contractor shall submit a letter to the City of New York, written on company letterhead, stating that a fully operational turnkey security system will be provided and installed as specified. The letter is to be signed by a principal /owner.
2. The Security Contractor shall be a specialist in, and shall be primarily engaged with integration, furnishing, fabricating and installing security equipment specified herein as pre-approved or having met all requirements listed herein or having been approved.
3. It is the City of New York's desire to have a single firm responsible for all electronic security systems integration work. Security Contractor may subcontract portions of its responsibilities for electronic systems integration, but approval of the second-tier subcontractor to the Security Contractor shall be required from the City of New York. The second-tier subcontractor, if any, shall meet qualification requirements identical to those required of the Security Contractor. Further, the second-tier subcontractor, if any, shall be transparent to the City of New York with respect to coordination, submittals and all and other project-related communications. The intent of this requirement is that the City of

New York have a fully qualified, single-point-of-contact with respect to all work for the security system. At City of New York's option, preference may be given to a single firm that can provide all work specified herein.

4. The Security Contractor's work shall include the furnishing and installation of security systems, equipment and materials described by the Specification.
 5. A fully integrated security system shall be installed, documented and tested, satisfactory to City of New York.
 6. The Security Contractor shall perform the work in phases at the direction of the contractor to ensure that the security system remains on schedule throughout construction.
 7. At all times, keep the premises free from accumulation of waste materials or rubbish caused by his operations. On a weekly basis and at the completion of the work the Security Contractor shall remove all his waste materials and rubbish from the project as well as all tools, construction equipment, machinery and surplus materials.
 8. Furnish a management staff Table of Organization which shall be submitted upon award of contract. The Security Contractor will supplement such management staff with whatever additional supervisory personnel are deemed necessary by the City of New York to insure that the work will be completed by the Time of Completion. The City of New York shall have the right to approve all Security Contractor's management staff and at the City of New York's reasonable request for cause, Security Contractor will replace any personnel unacceptable to the City of New York. Furthermore, each member of the Security Contractor's staff during and up until Final Acceptance of the Security System installation shall behave in accordance and comply with all the City of New York's and Job Site Rules and Regulations.
 9. Submit shop drawings for approval by the Commissioner. As-built drawings are required for system acceptance and Comprehensive Operating and Maintenance documentation in AutoCAD format
 10. Major Responsibilities of Security Contractor and Coordination with Other Trades:
 - a. The Security Contractor shall study the entire specification, both written and illustrated, of the entire project. The Security Contractor shall examine the drawings and specifications of other trades whose work may influence the installation of the security systems. The Security Contractor shall include in his bid all services attributed to coordinating the installation of the security system with the work of other trades. Prior to the start of work, the Security Contractor shall review the project drawings and specifications and shall coordinate his work with that of the Electrical Contractor and the Door Hardware Supplier. In particular, the Security Contractor shall coordinate such work as, including, but not limited to, the following: AC power feeds, power supply panels, wiring, conductors, conduit, raceway systems, and termination for supply of power for the security system components. Questions shall be promptly submitted to the Commissioner as Requests for Information (RFIs).
 - b. The Electrical Contractor shall furnish and install the power distribution and supply panels, wiring, conductors, conduits, and termination for the supply of 120 VAC power to security system components. It shall be the responsibility of the Security Contractor to provide the Electrical Contractor with complete information regarding 120 VAC requirements. The Electrical Contractor shall also be responsible for the installation of all conduits and/or cable trays required for supporting security low voltage (48 VDC or less) wiring.
- The Security Contractor shall furnish and install all security systems interconnecting wiring for low voltage (48VDC or less) wiring. The Security Contractor shall clearly mark all conductors and shall make all connections in accordance with local codes and standards.

G. Component, system and integration testing

1. All devices that will be mounted on the exterior of the building, or within a space that is not environmentally controlled for temperature and humidity, will be required to be field tested for verification of their ability to work within the conditions associated with the project. Only after a device is tested and approved by the Commissioner, can the device be installed for use as part of the permanent SMS solution. Prior to commencing the test, a written narrative defining the test, with sketches as appropriate, is to be submitted to the Commissioner for review and approval. The narrative is to identify what is to be tested, how the test will be conducted, what assistance will be required from other parties and what measures will be used to identify success.
2. Any device that is required to be installed in a manner that is not traditionally done or per the manufacturer installation means/methods shall be tested by creating a mock-up of the condition. A scaled or full-size mock-up will be determined on a case-by-case basis. Prior to commencing the mock-up, a written narrative defining the mock-up, with sketches as appropriate, is to be submitted to the Commissioner for review and approval. The narrative is to identify what is to be tested, how the test will be conducted, what assistance will be required from other parties and what measures will be used to identify success.
3. Any interface/integration between systems will be required to be proven prior to the system being furnished, installed and integrated. The Security Contractor is responsible to develop an Interface Control Document (ICD) which will define the interface, how the interface occurs, how the interface affects the two systems and the result of the interface. Once the ICD is approved, the contract shall develop operational mockups of the interfaces. The integration is to be first tested and demonstrated to the Commissioner. The test is to be conducted using the exact system and software versions proposed for furnish and installation, as well as the exact the peripheral devices/sensors that will be used as either inputs, outputs or integration points for final integration. Prior to commencing a test, the written narrative defining the test, with sketches as appropriate, is to be submitted to the Commissioner for review and approval. The narrative is to identify what is to be tested, how the test will be conducted, what assistance will be required from other parties and what measures will be used to identify success.

2.2 SUBMITTALS

- A. **Materials and Equipment List:** Within thirty (30) calendar days after award of contract, the Security Contractor shall submit for approval, three (3) sets of a complete list of all materials, equipment and accessories proposed for his Work in accordance with these Specifications and Contract Drawings. This list shall include manufacturers, complete catalog identification numbers and model or system designator, quantities, options, catalog "cuts", basic system architectural block diagrams, and CPU software operating features. The submittal shall be in sufficient detail whereby the Commissioner can readily identify the equipment and materials proposed. No consideration will be given to partial lists or lists submitted from time to time. Approval of materials and equipment will be tentative to the submission of complete shop drawings. The City of New York shall not be obligated in any manner for any materials, equipment or accessories which have not been accepted by the Commissioner.
1. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, controls and performance curves. Where Product Data must be specially prepared or modified because standard printed data is not suitable for use, submit as "Shop Drawings".
 2. Clearly mark each copy to identify pertinent products, models, and accessories. Show performance characteristics and capacities. Show dimensions and clearances required. Include the following information:

- a. Reference to appropriate specification section and subsection.
 - b. Compliance with recognized trade association standards.
 - c. Compliance with recognized testing agency standards.
 - d. Application of testing agency labels and seals.
 - e. Notation of dimensions verified by field measurement.
 - f. Notation of coordination requirements.
 - g. Manufacturer's printed recommendations.
3. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
- B. Shop Drawings: The shop drawing submittals shall include highly detailed, to-scale, instrument-drawn drawings describing the products (systems, equipment, devices and materials) and Security Contractor's services as to precise locations, mounting and installation methods, details and dimensions, equipment/system schedules, conduit sizing, conduit routing, riser diagrams, point-to-point interconnect diagrams, zoning schedules, system interface schedules or diagrams, power requirement schedules (per room and per cabinet/rack), stand-by/emergency power schedule (per room and per cabinet/rack).
1. No portion of the work shall commence nor shall any equipment be ordered until the submittals have been approved in writing by the Commissioner. All work shall be in accordance with approved submittals. A detailed completion schedule shall be submitted with all submittals.
 2. The Security Contractor's Drawings shall indicate, among other requirements noted herein, the accurate locations of all conduit, raceway, junction and utility boxes, termination panels, transformers (if any), power supplies, panels, and all other equipment noted.
 3. The Security Contractor's Drawings shall clearly illustrate all mounting locations and methods. While some drawing details may be "typical," the Security Contractor's Drawings shall illustrate the installation detail of each unique application.
 - a. Equipment schedules and details shall provide the following information, as, and if, appropriate in each case: door number; door type; door position switch; request-to-exit type; request-to-exit location; auxiliary request-to-exit device, if any; lock type; power requirements; emergency power; access control type; special installation requirements; timed-shunt times; shunt type; precise, to-scale mounting location; zone or point designation; remote control of lock by specific and designated control console; VSMS camera number activated by sensor or switch closure; input/output programming schedules; CPU output reports structure.
 - b. VSMS schedules and details shall provide the following information: camera number; camera type; camera model number; camera features (such as auto-iris or day/night); lens specification; power requirements; type of power input; cable type; length of cable run; camera mounts; camera housing; camera housing features (such as heater, blower, etc.); alarm homing; termination method; electrical protection (such as lightning). Additionally, the Security Contractor's drawings shall clearly illustrate the fields of view of each camera, as well as "park" positions for panning and zooming cameras. If the camera is capable of wide-angle and telephoto viewing, both fields of view shall be indicated. The installer's "aiming point" shall be indicated.
 4. As the security products will not be installed immediately (see Contractor's construction schedule for exact installation time periods), the City of New York reserves the right to require the contractor to provide the most current model number and version for each of the specified products, especially products affected by technology (servers, workstations, etc). The upgrade to the newer model number shall be based on the price provided for

the model numbers identified in these documents. The contractor shall submit a report identifying superseded model numbers four (4) months prior to the purchase/install of any security product. For example, if product MANUFACTURER model XYZ1 is specified and no longer available at the time of installation, the contractor shall provide the appropriate MANUFACTURER solution to meet the technical requirements. In addition, if any of the specified memory requirements increase, either speed or storage, the contractor shall upgrade to the higher requirements.

- C. Spare Parts and Components List: At the conclusion of the Security Contractor's Work, the Security Contractor shall submit to the Commissioner, a complete list of manufacturers' recommended spare parts and components required in order to satisfactorily maintain and service the systems for a minimum of one year.
- D. Operation, Maintenance, and Service Manuals: Prior to final acceptance, complete sets of operation, maintenance and service manuals shall be submitted for systems and equipment provided under this contract. The manuals shall be compiled, assembled and indexed into a single Portable Document File (.pdf) with active links and bookmarks to the individual sections. Three (3) copies of the this electronic document shall be submitted to the Commissioner prior to final acceptance testing, each copy on its own compact disc (CD) or digital versatile disc (DVD). The manuals shall include the following:
1. Complete operating instructions.
 2. Complete maintenance instructions, wiring diagrams, troubleshooting instructions.
 3. System service instructions for Work which manufacturers recommend user service.
 4. Complete parts lists for each major item of equipment and/or for each system.
 5. Complete collection of manufacturers' product and catalog literature for equipment and systems installed under this contract.
 6. Manufacturers' warranties.
 7. Operating characteristics, performance data, ratings, and manufacturers' specifications for each item of equipment or system.
 8. Where practical, internal wiring diagrams and schematics.
 9. Name, address, and telephone number for service for each item of equipment or system.
 10. Software User Documentation: Manual shall include operating instructions, programming instructions, technical documentation and maintenance procedures to permit making changes to system configuration.
- E. Formal Test Plan and Procedures: Sixty (60) calendar days prior to acceptance testing and final inspection, the Security Contractor shall provide a formal test plan and test procedures for the Commissioner's review and comment.

2.3 EXPOSED COMPONENTS

- A. Components exposed and accessible to the public shall be of a design and construction typical and suitable for such use. All device fasteners shall be an approved security type. All components and materials shall be resistant to vandalism and waterproof.

2.4 TAMPER PROVISIONS

- A. Excluding the cabinets located in the Security/Data Room and Security Equipment Room all enclosures, cabinets, housings, boxes, raceways, and fittings of every description having hinged doors or removable cover plates which contain circuits of the security system and its power supplies, shall be provided with cover-operated corrosion-resistant tamper switches, arranged to initiate an alarm signal when the door is moved as little as 6mm from its normally closed position. Tamper switches shall be mechanically mounted to maximize the defeat time when enclosure covers are opened and removed. The minimum amount of time required to

depress or defeat the tamper switch after opening or removing the cover shall be greater than one (1) second. Enclosure and tamper switch shall function in such a manner as to not allow direct line of sight to any internal components or the tampering of the switch or circuit wiring. Tamper switches shall be inaccessible until the switch is activated; have mounting hardware concealed so that location of the switch cannot be observed from the exterior of the enclosure; be under electrical supervision at all times, irrespective of the protection mode in which the circuit is operating; shall be spring-loaded and held in the closed position by the door protected; and shall be wired so that they break the circuit when the door is disturbed. Tamper switches on doors which must be opened to make normal maintenance adjustments to the system and to service the power supplies shall be of the push/pullset, automatic-reset type. Covers of pull and junction boxes provided to facilitate initial installation of the system need not be provided with tamper switches.

2.5 ALARM ANNUNCIATION

A. Alarm annunciation shall include intrusion detection, tamper, fail safe, line fault, and power loss.

1. Intrusion Detection: Intrusion detection alarms shall include the full range of interior point protection sensors, volumetric space, access control protection sensors, and duress alarms. Duress alarms shall be annunciated to clearly distinguish them from other intrusion detection alarms.
2. Tamper: Enclosures, cabinets, housings, boxes, raceways, and fittings having hinged doors or removable covers and which contain circuits for the security system and its power supplies, shall be provided with cover operated, corrosion-resistant tamper switches, arranged to initiate an alarm signal when the door or cover is moved as little as 6mm from the normally closed position. Tamper switches shall be mechanically mounted to maximize the defeat time when enclosure covers are opened or removed. The minimum amount of time required to depress or defeat the tamper switch after opening or removing the cover shall be one (1) second. Enclosure and tamper switch shall prevent direct line of sight to any internal components and prevent switch or circuit tampering. Tamper switches shall be inaccessible until the switch is activated; conceal mounting hardware so that location of the switch cannot be observed from the exterior of the enclosure; be under electrical supervision at all times, irrespective of the protection mode in which the circuit is operating; shall be spring-loaded and held in the closed position by the door or cover protected; and shall be wired to break the circuit when the door or cover is disturbed. Tamper switches on doors which must be opened to make normal maintenance adjustments to the system and to service the power supplies shall be of the push/pullset, automatic reset type. Tamper alarms shall be annunciated to be clearly distinguishable from intrusion detection alarms.
3. Fail-Safe Alarms: Provide a fail-safe capability in all critical elements of the system. Fail-safe is defined as the capability to monitor for proper system functions and to report an alarm when a failure is detected in any critical system function. This shall include, but not be limited to, the capability to monitor communication link integrity and to provide self-test. When diminished functional capabilities are detected, the system shall provide annunciation of the fault. Fail-safe alarms shall be annunciated to clearly distinguish them from other types of alarms.
4. Fail-Safe Locking: All locking shall be fail-safe to the extent that such locking is permitted by appropriate and pertinent life-safety and building codes. Fail-safe locking shall be understood to mean that upon failure, locks shall fail in the "unlocked" and "unsecured" position. All locking shall be interconnected into the building's fire alarm system and, upon activation of the fire alarm system, shall immediately "unlock" to permit emergency egress from the building. The Security Contractor shall coordinate all interface requirements with the fire alarm system installer. The Security Contractor shall furnish

- and install the necessary interface relays and interconnecting wiring, conduits, and mounting hardware, etc. to effect this operation.
5. Line Fault: As a minimum, fault isolation at the systems level shall have the same geographic resolution as provided for intrusion detection. The communication links of the security system shall have an active mode for line fault detection. Active mode is defined as that in which some type of signal is continuously sent across the link, resulting in simple link breaks being readily detected. The system shall be either a static system or a dynamic system. In a static system, the "no-alarm" condition shall always be represented by the same signal, which shall be different than the signal originally transmitted. The dynamic system shall represent "no-alarm" with a signal which continually changes with time.
 6. Power Loss: Provide the capability to detect when any critical component of the system experiences loss of primary power and/or is switched over to either emergency power or uninterruptible power and to declare an alarm. The alarm shall clearly annunciate the identity of the component experiencing the power loss.

2.6 LINE SUPERVISION

- A. Communication interconnection lines between the local control units and the central control shall be electrically supervised for open-circuit, short-circuit, grounding, and loss of data for all subsystems.
- B. Interconnecting lines from input sensors and tamper switches shall remain under constant supervision during both SECURE and ACCESS modes and also shall be provided with electrical line supervision for both opens in the wiring and/or shorted wiring. Systems whose sensors are passive (transmit signals only for alarm conditions) shall also be provided with, or shall provide as an integral part of the sensor, line supervision between sensors and control units. The circuit shall be supervised by monitoring changes in the direct current that flows through the detection circuit and a terminating resistor. The supervision circuit shall initiate an alarm in response to a current change of ten percent or greater.

2.7 MATERIALS NOT LISTED

- A. Furnish all necessary hardware, materials, and supporting equipment required to place in full operation the specified major subsystems. Some supporting equipment, materials, and hardware may not be described in the Contract Drawings and may not be identified herein. Depending on the manufacturers selected by the Security Contractor, some equipment, materials, and hardware may not be contained in either the Contract Drawings or these written Specifications, but are required by the manufacturer for full and complete operation in accordance with the intent of the design and these Specifications. In such cases, the Commissioner shall be given the opportunity to approve the additional equipment, hardware and materials which shall be fully identified in the bid and in the equipment list submittal. The Commissioner shall be consulted in the event that there is any question as to which supporting equipment, materials, or hardware are intended to be included.

PART 3 - EXECUTION

3.1 WASTE MANAGEMENT

- A. Separate and dispose of waste in accordance with the Project's Waste Management Plan.

3.2 CLOSEOUT

A. Substantial Completion Requirements:

1. Provide Final Cleaning immediately prior to Substantial Completion inspection.
2. Corrective Work:
 - a. Remove, Repair and Reinstall, or Restore in Place damaged items.
 - b. Replace damaged materials or items with New if repair not acceptable to Commissioner.
3. Provide product data to complete Operation & Maintenance Manuals.
4. Submit executed Warranties.

END OF SECTION 28 00 00

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SECTION 28 10 00 – ACCESS CONTROL AND ALARM MONITORING SYSTEM (ACAMS)

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide an integrated security management system in accordance with the contract documents. The work of this section includes, but is not limited to the following:
1. Section 28 00 00: Common Work Results for Electronic Security
 2. Section 28 20 00: Video Surveillance System (VSS)
 3. Section 28 30 00: Security Intercommunications System (SIS)
- B. The Contractor shall be responsible for providing a complete fully operational turnkey security system as specified within these documents.
1. Description of Work
 - a. This specification outlines the requirements for an integrated security management/access control system.
 - b. The Security Contractor shall provide and install the ACAMS , which shall include all computer hardware and software, printers, annunciation monitors, signage, communications devices, access control panel, reader electronics circuit boards, I/O boards, card readers, request-to-exit devices, intrusion detection sensors, duress switches, power supplies, and any conduit, wiring, conductors, raceways, termination cabinet enclosures, mounting hardware, and all other devices as indicated on the Contract Drawings and specified herein, which are not provided by the Electrical Contractor.
 - c. The ACAMS shall include, but not be limited to, smartcard card readers, magnetic contacts, electronic locking elements, intrusion detection devices, control panels, power supplies, cabling and software.
 - d. The ACAMS system server shall be installed as part of this project. The ACAMS system server shall serve as the central server for all workstations located within the project
- C. Functional Description
1. ACAMS shall allow for the system to control the building in zones, creating the ability for ART-NY to access all access controlled doors and to create groupings that will allow ART-NY to authorize access to specific spaces (i.e. theaters) by specific people or groups.
 2. ACAMS shall allow for access to be granted via the use of an electronic credential (card) or through the use of a PIN.
 3. ACAMS shall allow for monitoring and control to be capable locally (within the building itself) or remotely, from any compatible computer that is connected to the ART-NY network with the appropriate login and password permissions.
 4. Upgrades or expansion of the ACAMS to a larger size system in scale shall not require installation of a different and or new ACAMS application or require the administrator/operator to learn a different and or new interface from the previous version.
 5. The ACAMS shall be able to communicate via TCP-IP/Ethernet.
 6. Certain cameras associated with Access Controlled Doors shall automatically cue-up upon alarm or manually.

PART 2 - PRODUCTS

2.1 ACCESS CONTROL SYSTEM

A. Architecture

1. The system's primary function shall be to regulate access through specific doors and gates to secured areas of the facility and provide computer generated color direct card credentials for that use. The system must utilize a single seamlessly integrated database for both its access control and badging functionality. This integration shall be provided under one operating environment. The system's operating environment shall be the fully multi-tasking multi-threading Microsoft Windows XP Professional Operating System. The system shall be written so that the Access Control and the badging Systems are developed and built from a unified 32-bit source code set. There shall not be separate source code bases for the Access Control and badging modules of the system.
2. The system shall allow the configuration of an alarm monitoring workstation, an administrative workstation and an integrated workstation (which shall include any combination of the above). The system shall be expandable to support an unlimited number of badging and/or display workstations, and an unlimited number of alarm monitoring, administrative, or integrated workstations. All access control field hardware, including access control panels (ACP's) shall be connected to every Windows XP Professional based access control system workstation on the network.
3. The alarm monitoring workstation must be able to connect to and monitor field hardware devices, such as card readers and ACP's. Administrative tasks such as defining access groups, time zones, generating reports, creating maps, etc. shall be provided from any workstation on the network which is licensed to do so. The enrollment & badging workstation shall serve as both the credential creation and data input workstation for the cardholder management module of the system. The integrated workstation shall allow for all functions of enrollment and badging, administration, and alarm monitoring to be available from the single workstation. All system data must reside on a single database on the network and must be accessible in real time to every/any system workstation connected to the network. This shall allow for automatic change propagation to all workstations on the system as well as a common database to consolidate all information and allow for better disaster recovery.

B. ACAMS Software Capabilities

1. The ACAMS Software shall support 256 card readers, input points, video cameras, intrusion detection points, and relay outputs. The ACAMS database server shall support 50,000 cardholders, visitors, and assets limited only by the available memory on the ACP. The database server shall also support an unlimited number of system events and System Operator transactions in the history file. Client Workstations shall be limited only by the limitations of the operating system server software.

C. Time Zones

1. The ACAMS shall be capable of creating and storing up to two hundred fifty five (255) time zones. Each time zone shall have a minimum of six (6) intervals. Each interval shall be assignable to any day of the week and capable of being restricted on a minimum of eight (8) types of holidays. Each time zone shall be assignable to an alphanumeric name of up to 64 characters. Time zones shall be applied to access levels, card reader modes, alarm inputs, alarm outputs, and alarm masking and logging functions. Time zones shall

be allowed to belong to any or all access levels so that the time zone only has to be defined once.

D. Access Levels

1. The ACAMS shall be capable of defining a minimum of 32,000 access levels with a minimum of 32 access levels per cardholder per segment. Access Levels shall consist of a combination of card readers and time zones.
2. Each Access Level shall be assignable to an alphanumeric name using up to 64 characters.
3. Card readers shall have the ability to be assigned to any or all access levels defined in the ACAM. Individual card readers shall be capable of having a distinct time zone assigned to it.
4. The ACAMS shall allow an 'Allow User Commands' option to be assigned on a per access level basis where keypad readers are in use. User commands may be specific to the operators required duties.

E. Temporary Access Levels

1. The ACAMS shall be capable of assigning Temporary Access Levels inclusive of the 32,000 assignable Access Levels.
2. Each Temporary Access Level shall be assignable to an alphanumeric name using up to 64 characters.
3. Each Temporary Access Level shall be definable with a start and end date.

F. Access Groups

1. The ACAMS shall be capable of assigning Access Groups with a maximum of 32 Access Levels per Access Group.
2. Each Access Group shall be assignable to an alphanumeric name using up to 64 characters.

G. Precision Access Levels

1. The ACAMS shall be capable of assigning Precision Access Levels in addition to the 32,000 Access Levels with the ability to assign unlimited card reader and time zone combinations.
2. Each Precision Access Level shall be assignable to an alphanumeric name using up to 64 characters.

H. Holidays

1. The ACAMS shall provide a minimum of 255 Holiday assignments using an embedded calendar. Holidays shall be assigned an alphanumeric name using up to 64 characters and shall be grouped into eight (8) types of holidays, and shall be assignable to individual time zones. Access rights, card reader modes, and alarm masking schedules must be able to be altered when the current date is designated a Holiday.
2. Dates for Daylight Savings Time changes shall be definable and shall take effect automatically.
3. The ACAMS shall support Holiday Ranges that allow a single holiday to span across multiple calendar days.

I. First Card Unlock

1. The ACAMS shall provide a First Card Unlock feature that when configured retards a pre-determined time zone activated unlock command until a valid credential has been presented and granted access to the portal.

J. Field Hardware Communications

1. The ACAMS shall communicate with the ACPs by using CP/IP
2. Communication baud rate shall be system selectable with a range between 1,200 to 115,200 bits per second.
3. Download communication between the ACAMS and the ACP shall be fully multi-tasking and shall not interfere with operational functions.
4. Upon loss of communications between the ACAMS Server and the ACP an alarm shall be created with a time stamp. Upon re-established communication the ACAMS and the ACP shall automatically re-synchronize from the point of communication loss without operator intervention.

K. Global Input / Output / Event Linkage

1. The ACAMS shall support a global linkage feature whereby any input/output/event shall be linked to any other input/output/event in the ACAM. Input / Output Linkages shall be able to span across Intelligent System Controllers.
2. System Administrators shall be able to create global I/O function lists, each consisting of a sequence of actions to be performed, such as changing card reader modes, activating outputs, and opening or closing anti-passback areas. Each function list may include up to six actions.

L. Alarm/Event Logging

1. All alarms and events in the ACAMS shall by default, always be recorded in the database. The ACAMS shall give System Administrators the ability to select on a time zone basis, the times that they require the ACAMS to log specific events to the database.
2. System Administrators shall have the option for Alarm/Events to be set to log or not to log particular alarms/events on any individual reader and or input.

M. Scheduling Utility

1. The ACAMS shall provide an integral Scheduling Utility. The Scheduling Utility shall allow System Administrators to schedule actions to occur on a one-time or a recurring basis. Recurring schedules shall be configured to begin immediately, last indefinitely, or have optional start and end dates.
2. The Scheduling Utility shall be available from both the System Administration and Alarm Monitoring modules.
3. The Scheduling Utility shall maintain a history log in the database for actions that it executes.

N. Card Reader Time Zone Overrides

1. The ACAMS shall allow for the pre-defined default card reader settings to be overridden or temporarily changed on a time zone basis. At the beginning of the selected time zone, the selected card reader's operational mode shall be modified from it's default mode to any one of the following modes: locked, unlocked, facility code, card only, card or PIN, card and PIN, card and Biometric, card or PIN and biometric, and/or card and PIN and

biometric. The aforementioned options shall be available depending on the type of card reader utilized

2. Each card reader shall have the ability to have multiple time zone setting overrides assigned to them as required by the System Administrator.

O. Monitor Zones

1. The ACAMS shall provide System Administrators the ability to segment their access control ACAMS field hardware devices into various zones or areas where Alarm Monitoring client workstations will monitor. These zones shall be assigned an alphanumeric name using up to 128 characters.
2. The ACAMS shall allow subset relationship devices (such as card readers or ICMs (Input Control Module) to Intelligent System Controllers) to be automatically part of the monitoring zone when an ACP is selected AND it shall allow the System Administrator to define which subset devices (card readers, ICMs, etc.) belong to that monitor zone.
3. Updating of monitor zones shall take place in real time and without requiring operators to re-login.

P. Alarm/Event Routing

1. The ACAMS shall be capable of allowing System Administrators to route alarms and events to various Alarm Monitoring client workstations on the network. The ACAMS shall allow any alarm or event to be routed to one or multiple client workstations on the network regardless of where the alarm is generated in the field. Alarms shall be routed to client workstations on a device by device level.
2. The ACAMS shall implement network synchronization that in the event alarm/event is routed to multiple client workstations, once the first client workstation 'grabs' the alarm, the alarm/event shall be cleared from all other client workstations. As such, alarms that are routed to an Alarm Monitoring client workstation which does not have a System Operator logged in shall be queued so that all unacknowledged alarms will report to that client workstation once a System Operator has logged into the ACAM. Alarms/Events shall be routed based on default settings or time zone control.
3. Text Instructions
 - a. The ACAMS shall allow for a set of text instructions to be associated with each alarm that arrives into the ACAM. The text instruction function shall allow the System Administrator to enter a minimum of 32,000 characters of text for procedures to follow for each alarm that arrives at the Alarm Monitoring client workstations. Each alarm or event in the ACAMS shall have it's own unique set of text instructions should the System Administrator desire.
4. The System Administrator shall have the ability to configure how the ACAMS handles the annunciation of alarms on an individual basis. Each alarm and/or event shall have the option(s) to:
 5. Display at one or more Alarm Monitoring client workstation.
 6. Allow higher priority alarms to be displayed on the Alarm Monitoring client workstation ahead of lower priority alarms.
 7. Require the field device, which generated the alarm to be restored to its normal state before the alarm is cleared.
 8. Print the alarm to the local event printer.
 9. Have a customized voice message annunciate at the client workstation.
 10. Have the alarm breakthrough to the Alarm Monitoring window should the System Operator be working in another application
 11. Allow System Operators to change the journal entry once the alarm has been acknowledged.

12. Insure that the alarm will not be able to be deleted from the Alarm Monitoring window upon acknowledgment.
13. Display text and audio instructions outlining the procedures to follow when responding to the alarm.
14. Automatically call-up associated maps.
15. Automatically call up the associated cardholder record.
16. Automatically call up the associated cardholder photo using the video verification function.
17. Require a password to view the alarm.
18. Require a password to acknowledge the alarm.
19. Require acknowledgment to clear.
20. Allow mandatory journal entry upon acknowledgment.
21. Use pre-defined journal entries for alarms.
22. Select the option for journal entry based upon the specific alarm.
23. Send CCTV interface commands to the digital video recorders
24. Automatically send an e-mail message.
25. Automatically send an alphanumeric page.
26. Have the alarm appear on the Alarm Monitoring window with a flashing colored coded bar across the alarm for high priority alarms.
27. Have the alarm, when acknowledged, display an alternative flashing color coded bar across the alarm than for the original alarm color.
28. Trigger a function list(s) when the alarm is acknowledged.
29. Require User Logon for Acknowledgment

Q. Alarm-Event Mappings

1. The ACAMS attributes in Alarm Attributes shall be assignable on a 'global' basis to all devices that share an alarm description. Thus, the 'door forced open' alarm attributes shall apply to any door with a card reader that is forced opened in the ACAM. The ACAMS shall have the capability to assign a unique group of alarm attributes to specific device/alarm combinations to override the global settings for specific case settings. Each device/alarm combination shall have the ability to have it's own unique attribute set if the System Administrator desires.

R. System Downloads

1. The ACAMS shall provide for the downloading of data to the ACPs. Downloads shall load ACAMS information (time zones, access levels, alarm configurations, etc.) into the ACPs first, followed by cardholder information and card reader configurations.
2. All ACPs on the ACAMS shall be downloaded simultaneously (in parallel with one another) and bi-directionally so that alarms will still report to their respective Alarm Monitoring client workstations as cardholder information is being downloaded.
3. A complete database download of no less than 10,000 cardholder records to all ACPs (regardless of the number of ACPs) must be complete within ten (10) minutes.
4. Information on cardholder status, badge status, time zones or access levels shall download in real time as they are added, modified, or deleted from the ACAM.

S. Current Status Indication

1. The Alarm Monitoring window shall provide a status indicator that displays the current status of alarms, card readers, ACPs and ICMS.
2. Color Coding for Alarm Priorities
3. The ACAMS shall display alarms in the active Alarm Monitoring window with a flashing colored bar across the alarm based upon priority. Acknowledged alarms may be set with

alternate color-coding. A minimum of 255 colors must be available for assignment to a minimum of 255 priority levels.

- T. Pre-Defined "Canned" Alarm Acknowledgment Responses
1. The ACAMS shall have the capability for pre-defined alarm acknowledgment responses for alarms in the ACAM. An unlimited number of pre-defined responses shall be able to be configured for each alarm in the ACAM.
- U. Test Mode
1. The ACAMS shall support a Test Mode for Alarm Inputs, Door Forced Open, Access Grants. Tests on Input Device Groups shall be available to verify that all inputs within the group are operational. Upon entering into Test Mode and for the duration of the test, alarms from members of the group shall either be displayed in a separate window/view on test Alarm Monitoring client workstations or on all Alarm Monitoring client workstations in which the alarms are usually routed. During the test (the duration of the test shall be set by the System Operator), all inputs within the group are manually activated in the field. At the end of the time duration, a report shall be generated flagging any inputs for alarms that were not received. During the Test Mode, all alarm operations carry on as programmed (i.e. Global I/O functions, CCTV commands, printer activity, etc.) so that all functions are tested.
- V. Manual Control
1. The ACAMS shall provide the System Operator the option to manually control over all output points or input points connected to the ACAM. Control points are defined as any door strike, auxiliary card reader output, or any other relay output point of an Output Control Module (OCM).
- W. Video Surveillance System
1. The ACAMS shall be capable of passing alarm information via Ethernet protocols.
- X. Real-Time, Dynamic Graphical Maps
1. The ACAMS shall support graphical maps that display device / group status, function lists and video cameras dynamically in real-time. The maps may be configured to appear on command or when specified alarms are selected for acknowledgment. Map device icons shall have the ability to dynamically change shape and / or color to reflect the current state of the device.
- Y. Alarm Filtering
1. The ACAMS shall have the capability for filtering out alarm types from the Alarm Monitoring window. Alarms that may be filtered are access granted alarms, access denied alarms, system alarms, duress alarms, and area control alarms. If applicable, fire alarms, asset alarms, intercom alarms, central station receiver alarms, intrusion detection alarms, video event alarms, and transmitter alarms may also be filtered.
- Z. Sorting Capabilities
1. The ACAMS shall allow System Operators to arrange the way that alarms and/or events in the Alarm Monitoring window are listed by sorting the alarms and events. Sort criteria

shall be based on priority, time/date, ACP, Card Reader, ICM, Input Device, or Cardholder. Additionally alarms and events can be sorted based on asset scan ID, asset name, intercom station, intrusion panel, transmitter, or transmitter input.

AA. E-mail Interface

1. The ACAMS shall support an e-mail interface seamlessly integrated within the ACAMS Alarm Monitoring module. System Operators shall have the ability to manually or automatically send ASCII text e-mail messages from the Alarm Monitoring module on demand regarding any alarm currently displayed in the Main Alarm Monitoring window. E-mails shall have the ability to be sent to multiple e-mail accounts if desired. The ACAMS shall integrate with Microsoft Exchange Server.

2.2 CARD READERS

- A. Shall be of the smartcard type.
- B. Shall be capable of a read range up to 2-inches from reader.
- C. The reader shall operate within the temperature range of minus 40 degrees to plus 65 degrees centigrade with relative humidity of 95 percent non-condensing. Reader shall be designed to operate on low voltage AC or DC. An alarm signal shall be provided to indicate failure of any portion of this internal power supply equipment.
- D. A LED on the front surface of the reader shall indicate to the user that the card or tag presented to the reader has been read. An audio beep tone to indicate that the card has been read. Visual indication that a card has been decoded and deemed valid or invalid shall be provided at each reader location by green and red LED's respectively.

2.3 CARD READER W/ KEYPAD

- A. Shall be similar in style and function as a card reader, but shall incorporate a 12-button keypad integrated into the front of the reader.

2.4 INTRUSION DETECTION DEVICES

A. Magnetic Contact Switch:

1. The contact contains a hermetically sealed magnetic reed switch. Switches shall be reed switches, epoxied and/or potted in the switch housing. Magnets shall be permanent Alnico type, finish to match door jam. The contact shall be triple-biased for additional security.
2. Switches shall rated at 30 VDC (50 mA) for 1,000,000 cycles, minimum.
3. Housings shall be molded of stainless steel. Magnetic contact switches shall be protected to deter sticking or freezing.
4. The gap distance shall be up to 0.4"

B. Motion Detector:

1. Wall Mounted
 - a. Dual technology utilizing range controlled radar and passive infrared.
 - b. Pet immunity up to 80lbs.
 - c. Target velocity detection between 0.5 ft/sec to 5 ft/sec.

- d. Mounting height capable up to 9ft.
- 2. Ceiling Mounted
 - a. Dual technology utilizing microwave and passive infrared.
 - b. Target velocity detection between 0.5 ft/sec to 5 ft/sec.
 - c. Mounting height capable up to 12ft.

PART 3 - EXECUTION

3.1 GENERAL

- A. The Security Contractor shall provide "as-built" drawings showing conduit routings, point-to-point wiring diagrams and any deviations from the Contract Documents.

3.2 INSTALLATION

- A. The system shall be installed by qualified technicians who have been factory trained and certified.
- B. Wiring shall be uniform and in accordance with national electric codes and manufacturers instructions.
- C. Equipment shall be firmly secured, plumb, and level.
- D. All splices shall be in easily accessible junction boxes or on terminal boards.
- E. All cable runs at the main terminal board and in all junction boxes shall be tagged and identified.
- F. Coordinate all work with other effected trades and contractors.
- G. Security contractor responsible for verifying all cabling requirements and coordinating with the electrical contractor. It is the electrical contractor who is responsible for providing and installing all wiring. The security contractor is responsible for terminating wires to devices.

3.3 CABLING

- A. All wiring where exposed shall be installed in conduit, minimum 3/4" or larger, in accordance with NFPA 70 and local codes.
- B. All cables shall be terminated and connected onto termination strips. Conductors at all junction points or termination shall be tagged with conductor identification.

3.4 SYSTEM INITIALIZING AND PROGRAMMING

- A. System shall include all software necessary for system configuration.
- B. System shall be turned on and adjustments made to meet requirements of specifications and on-site conditions.
- C. System shall be programmed to function as specified.

3.5 WASTE MANAGEMENT

- A. Separate and dispose of waste in accordance with the Project's Waste Management Plan.

3.6 CLOSEOUT

- A. Substantial Completion Requirements:

1. Provide Final Cleaning immediately prior to Substantial Completion inspection.
2. Corrective Work:
 - a. Remove, Repair and Reinstall, or Restore in Place damaged items.
 - b. Replace damaged materials or items with new if repair is not acceptable to the City of New York.
3. Provide product data to complete Operation & Maintenance Manuals.

END OF SECTION 28 10 00

SECTION 28 20 00 – VIDEO SURVEILLANCE SYSTEM (VSS)

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide an integrated security management system in accordance with the contract documents. The work of this section includes, but is not limited to the following:
 - 1. Section 28 00 00: Common Work Results for Electronic Security
 - 2. Section 28 10 00: Access Control and Alarm Monitoring System (ACAMS)
 - 3. Section 28 30 00: Security Intercommunications Systems (SIS)
- B. The Contractor shall be responsible for providing a complete fully operational turnkey security system as specified within these documents.
- C. Functional Description
 - 1. The primary functions of the VSS shall be for alarm assessment, access control verification purposes and general surveillance.
 - 2. The system shall interface with the ACAMS through an Ethernet interface.
 - 3. The network video recorder shall be programmed to record all video at no less than 5 frames per second (in-activity), 24 hours/7days a week at a minimum resolution of 4CIF. The digital video shall be stored for a period of 30 days. The VSS shall be capable of increasing the frame rate to 15 frames per second upon alarm conditions.

PART 2 - PRODUCTS

2.1 NETWORK VIDEO SYSTEM

- A. The video surveillance head-end equipment (network video system) shall be IP-based and shall be capable of storing and managing all video via the network.
- B. Video equipment shall be capable of, and sized, to provide recording with the following requirements (requirements identified to provide a baseline):
 - 1. 15fps, all cameras and continuous
 - 2. 4 CIF
 - 3. Average storage length: 14 days

2.2 STANDARD DEFINITION FIXED IP CAMERA

- A. The camera must have independent 'serverless' operation. Full functionality must be available without the need to use up network bandwidth contacting a central license or administration server.
- B. The camera must have a 1/4" interlace scan sensor.
- C. The camera must have 768x494(NTSC) / 752x582 (PAL) active pixels.
- D. The camera must have a horizontal resolution of at least 490 TVL Color, 540 TVL Mono

- E. The camera must have sensitivity (50IRE, F1.2) Day: 0.5 Lux; Day/Night: 0.5 Lux color / 0.05 Lux mono
- F. Lens Options:
 - 1. Standard: 3.8mm - 9.5mm, Horizontal view angle 53.9° (W) 22.3° (T), F1.2, Auto-iris, Vari-focal
 - 2. Telephoto: 9.0mm - 22mm, Horizontal view angle 22.8° (W) 9.6° (T), F1.2, Auto-iris, Vari-focal
- G. Lens Mount: CS or C mount
- H. Gamma 0.45
- I. Gain Control Automatic or fixed manual setting across a 32dB range
- J. Scan Mode 4CIF Interlaced; 2CIF/CIF Non-interlaced
- K. Synchronization Internal
- L. Back Light Compensation On or Off
- M. White Balance Mode: Auto; Fluorescent; Indoor; Outdoor
- N. Iris Control: Auto-iris DC drive lens as standard
- O. Shutter Speeds 1/60 to 1/100,000 (NTSC), 1/50 to 1/100,000 (PAL) or Auto*
- P. Operating voltage: Power over Ethernet (802.3af); 24V AC/DC @ 0.29A;
- Q. Power consumption: 8W Max
- R. H.264 Video Compression: Full frame rate guaranteed, full color: H.264 (ISO 14496-10); 25/30fps
- S. Video Bit Rate: User-configurable bit rates from 32Kbps up to 6Mbps
- T. The camera must support multiple encoders allowing streaming of video at different resolutions.
- U. H.264 Resolutions:
 - 1. CIF: 352 x 288 pixels (PAL); 352 x 240 pixels (NTSC)
 - 2. 2CIF: 704 x 288 pixels (PAL); 704 x 240 pixels (NTSC)
 - 3. 4CIF: 704 x 576 pixels (PAL); 704 x 480 pixels (NTSC)
- V. Video Output NTSC/PAL composite video, 75 Ohms 1V p-p, Terminal block connector
- W. Binary Input/Output 2 opto-isolated inputs; 1 solid state opto-isolated relay output
- X. Network interface: IEEE802.3 and IETF standards: 10/100 Base-T Ethernet, TCP, UDP, ICMP, IGMP, SNMP, HTTP
- Y. Embedded Linux firewall

- Z. Up to 16 simultaneous unicast video users plus unlimited multicast users
- AA. Time: Embedded real-time clock, NTP client
- BB. Dimensions/Weight 175mm (depth) x 88mm (width) x 45mm (height) / 0.5Kg
- CC. Operating Temperature: 0°C to 45°C

2.3 SPECIALTY FIXED MINI IP CAMERA

- A. Minimum Illumination: 2.0 lux
- B. Number of Effective Pixels: 3 Megapixel
- C. Shutter Speed: 1s to 1/10000s
- D. Gain Control: Auto
- E. Exposure Control: Auto, EV Compensation
- F. White Balance: Auto, Manual or Preset
- G. Horizontal Viewing Angle: 88 degrees
- H. Focal Length: 3.3mm
- I. Day/Night Feature
- J. Video Compression: H.264, MPEG-4 or JPEG
- K. Dual Streaming
- L. Built-in Motion Detection
- M. RJ-45 Connection for Ethernet

PART 3 - EXECUTION

3.1 GENERAL

- A. The Security Contractor shall provide "as-built" drawings showing conduit routings, point-to-point wiring diagrams and any deviations from the Contract Documents.
 - 1. Installation
 - a. The system shall be installed by qualified technicians who have been factory trained and certified.
 - b. Wiring shall be uniform and in accordance with national electric codes and manufacturers instructions.
 - c. Equipment shall be firmly secured, plumb, and level.
 - d. All splices shall be in easily accessible junction boxes or on terminal boards. Splices within any length of the VSS camera signal cable shall not be acceptable and will be rejected during testing and commissioning by the Commissioner.

- e. All cable runs at the main terminal board and in all junction boxes shall be tagged and identified.

- B. Coordinate all work with other affected trades and contractors.

3.2 CABLING

- A. All wiring and cabling shall be installed by the Security Contractor in accordance with National and local codes and shall be installed in conduit where shown on the plans. The Security Contractor shall furnish and install all VSS hardware.
- B. All wiring where exposed shall be installed in conduit, minimum 3/4" or larger, in accordance with NFPA 70 and local codes.
- C. The Security Contractor shall furnish the appropriate cabling to prevent any degradation in the quality of the video and speed/control of pan-tilt and zoom cameras.

3.3 SYSTEM INITIALIZING AND PROGRAMMING

- A. System shall include all software necessary for system configuration.
- B. System shall be turned on and adjustments made to meet requirements of specifications and on-site conditions.
- C. System shall be programmed to function as specified.

3.4 WASTE MANAGEMENT

- A. Separate and dispose of waste in accordance with the Project's Waste Management Plan.

3.5 CLOSEOUT

- A. Substantial Completion Requirements:
 - 1. Provide Final Cleaning immediately prior to Substantial Completion inspection.
 - 2. Corrective Work:
 - a. Remove, Repair and Reinstall, or Restore in Place damaged items.
 - b. Replace damaged materials or items with New if repair is not acceptable to City of New York.
 - 3. Provide product data to complete Operation & Maintenance Manuals.

END OF SECTION 28 20 00

SECTION 28 30 00 – SECURITY INTERCOMMUNICATIONS SYSTEM (SIS)

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide an integrated security management system in accordance with the contract documents. The work of this section includes, but is not limited to the following:
 - 1. Section 28 00 00: Common Work Results for Electronic Security
 - 2. Section 28 10 00: Access Control and Alarm Monitoring System (ACAMS)
 - 3. Section 28 20 00: Video Surveillance System (VSS)
- B. The Contractor shall be responsible for providing a complete fully operational turnkey security system as specified within these documents.
- C. Functional Description
 - 1. Provide an IP-based intercom system that will allow a sub-station and a master station to communicate with each other as well as communications with a smartphone that is operating on the ART-NY local network.
 - 2. Provide ability to conduct 2-way audio communication between a master station and a sub-station, and between two master stations.
 - 3. Provide ability for a master station to conduct 1-way video assessment of the sub-station.
 - 4. Provide ability for a master station to remotely release an electronically access controlled door where the sub-station is located.

PART 2 - PRODUCTS

2.1 MASTER STATION

- A. Capable of receiving calls from sub-stations and also placing calls between masters.
- B. Security Operations Center Master Station shall utilize a built-in speaker for listening and a gooseneck microphone for speaking.
 - 1. Call acknowledgement button to open the line of communications for an incoming call.
- C. Security Screening offices shall utilize a handset for listening and speaking.
 - 1. Call acknowledgement to open the line of communications for an incoming call shall be initiated through lifting the handset from the base unit.
- D. Equipment with a dedicated call button for each other master connected to the system.
- E. Equipped with a ringer to audibly notify operator of an incoming call. Ringer volume to be adjustable by user.
- F. Equipped with a LED indicator to visually notify operator of an incoming call.
- G. Equipped with volume control for speaker/handset.

- H. Equipped with a color monitor for viewing camera associated with sub-station.
- 2.2 SUB-STATION
- A. Single button activation to initiate a call to a master station.
 - B. Sub-stations shall be constructed such that they are tamper proof and vandal resistant.
 - C. Equipped with a color video surveillance camera.

PART 3 - EXECUTION

3.1 GENERAL

- A. The Security Contractor shall provide "as-built" drawings showing conduit routings, point-to-point wiring diagrams and any deviations from the Contract Documents.

- 1. Installation

- a. The system shall be installed by qualified technicians who have been factory trained and certified.
- b. Wiring shall be uniform and in accordance with national electric codes and manufacturers instructions.
- c. Equipment shall be firmly secured, plumb, and level.
- d. All splices shall be in easily accessible junction boxes or on terminal boards. Splices within any length of the VSS camera signal cable shall not be acceptable and will be rejected during testing and commissioning by the Commissioner.
- e. All cable runs at the main terminal board and in all junction boxes shall be tagged and identified.

- B. Coordinate all work with other effected trades and contractors.

3.2 CABLING

- A. All wiring and cabling shall be installed by the Security Contractor in accordance with National and local codes and shall be installed in conduit where shown on the plans. The Security Contractor shall furnish and install all VSS hardware.
- B. All wiring where exposed shall be installed in conduit, minimum 3/4" or larger, in accordance with NFPA 70 and local codes.
- C. The Security Contractor shall furnish the appropriate cabling to prevent any degradation in the quality of the video and speed/control of pan-tilt and zoom cameras.

3.3 SYSTEM INITIALIZING AND PROGRAMMING

- A. System shall include all software necessary for system configuration.
- B. System shall be turned on and adjustments made to meet requirements of specifications and on-site conditions.
- C. System shall be programmed to function as specified.

3.4 WASTE MANAGEMENT

- A. Separate and dispose of waste in accordance with the Project's Waste Management Plan.

3.5 CLOSEOUT

- A. Substantial Completion Requirements:

1. Provide Final Cleaning immediately prior to Substantial Completion inspection.
2. Corrective Work:
 - a. Remove, Repair and Reinstall, or Restore in Place damaged items.
 - b. Replace damaged materials or items with New if repair is not acceptable to City of New York.
3. Provide product data to complete Operation & Maintenance Manuals.

END OF SECTION 28 30 00

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SECTION 28 31 11 - FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This work includes expanding the existing building fire alarm system into the theater spaces. The existing system is maintained by Highrise Fire Protection (Contact: 718-369-3434), for ease of coordination and to minimize the disruption of the existing system, it is expected that the Electrical Contractor will coordinate this work with Highrise.
- B. The system shall include all wiring, raceways, pull boxes, terminal cabinets, outlet and mounting boxes, control equipment, alarm, and supervisory signal initiating devices, alarm notification appliances, and all other accessories and miscellaneous items required for complete operating system even though each item is not specifically mentioned or described. Provide notification appliance circuit (NAC) booster panels as required, including 120V power and smoke detector at each NAC booster location. Scope shall also include retesting the existing fire alarm system due to the new fire alarm device additions.
- C. Related Sections include the following:
 - 1. Division 23 for coordination with air handling equipment and sprinkler systems.
 - 2. Division 23 "Instrumentation and Controls for HVAC"

1.3 DEFINITIONS

- A. General: Wherever mentioned in this specification or on the drawings, the equipment, devices, and functions shall be defined as follows:
 - 1. Alarm Signal: A signal that indicates a state of emergency requiring immediate notification of the fire department and of the building occupants. These are signal such as the operation of a manual pull station, the activation of a waterflow detector in a sprinkler system, or the receipt of an alarm signal from a smoke detector that has gone through alarm verification.
 - 2. Supervisory Signal: A signal that indicates the impairment of a fire protection system that may prevent its normal use. These are signals from switches, such as a valve supervisory switch; a low air pressure switch; a high air pressure switch; a fire pump phase reversal switch; a fire pump loss of power switch; a fire pump running switch, or from the operation of a duct smoke detector.
 - 3. Trouble Signal: A signal which indicates that a fault, such as an open circuit or ground, has occurred in the fire alarm system or in a separate sub-system, whose control panel is monitored by the fire alarm system.
 - 4. Multiplex System: A system in which multiple signals are transmitted via the same conduction path to a remote fire alarm control unit and fire alarm control panel, decoded and separated so that each signal will initiate the specified response.

5. **Hard Wired System:** A system in which alarm and supervisory initiating devices are directly connected, through individual dedicated conductors, to a central control panel without the use of multiplexing circuits or devices.
 6. **Notification Appliance Circuit:** A circuit to which notification appliances are connected to visibly and audibly indicate an alarm signal.
 7. **Interface Device:** An addressable device that interconnects hard-wired systems or devices to a multiplex system.
 8. **Remote Annunciator Panel (RAP):** A display panel, remote from the fire alarm control panel, that may provide transfer of condition to relays or devices connected to the fire alarm control panel; reports to and receives signals from the fire alarm control panel; visually displays all system conditions; and shall provide control of some fire alarm functions, such as acknowledge, silence, and reset. This panel does not contain FACP control modules, hardware or distributed control intelligence; rather it acts as a duplicate fire alarm system display unit.
 9. **Fire Alarm Control Panel (FACP):** A master control panel having the features of a fire alarm control unit and to which all remote fire alarm control units are interconnected. The panel has central processing, memory, input and output terminals, and printer.
 10. **Class A Wiring:** A circuit that is monitored for integrity such that a single break, a single wire-to-wire short, or a single loss of carrier condition will be indicated by a trouble signal on the FACP no matter where the break, short or loss of carrier condition occurs and will allow all functions of the affected circuit to remain operational. In accordance with NFPA 72, this would be Style 7 wiring for signaling line circuits.
 11. **Class B Wiring:** A circuit that is monitored for integrity such that a single break, a single wire-to-wire short, or a single loss of carrier condition will be indicated by a trouble signal on the FACP no matter where the break, short or loss of carrier condition occurs, but which would prohibit devices beyond the fault, short or carrier loss from remaining operational. In accordance with NFPA 72, this would be Style 4 wiring for signaling line circuits, Style B for initiating device circuits, and Style Y for notification appliance circuits.
 12. **Signaling Line Circuit:** A circuit to which any combination of circuit interfaces, control units, or transmitters are connected and over which multiple system input signals or output signals, or both, are carried.
 13. **Manual Pull Station:** A fire alarm box as indicated in NFPA 72.
 14. **Valve Supervisory Switch:** A valve monitor switch as indicated in NFPA 72.
 15. **Initiating Device:** A system component that originates transmission of a change of state condition, which initiates an appropriate response via the fire alarm system.
 16. **Terminal Cabinet:** A steel cabinet with locking, hinge-mounted door in which terminal strips are securely mounted. Minimum size is 8" x 8" (200 mm x 200 mm).
- B. **LED:** Light-emitting diode.
- C. **NICET:** National Institute for Certification in Engineering Technologies.
- D. **Definitions in NFPA 72 apply to fire alarm terms used in this Section.**

1.4 PERFORMANCE REQUIREMENTS

- A. Applicable Publications: Provide a system conforming to the requirements of the latest edition of the following publications including all amendments to these publications:
1. American National Standards Institute
 - a. S3.41 Audible Emergency Evacuation Signal
 2. American Society for Testing and Materials (ASTM):
 - a. E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
 - b. E 119 Standard Test Methods for Fire Tests of Building Construction and Materials
 3. American Society of Mechanical Engineers (ANSI/ASME):
 - a. C62.41 Guide for Surge Voltages in Low Voltage A.C. Power Circuits
 4. International Code Council, Inc. (ICC):
 - a. International Building Code (IBC)
 - b. International Mechanical Code (IMC)
 - c. International Fire Code (IFC)
 5. National Fire Protection Association (NFPA):
 - a. 70 National Electrical Code (NEC)
 - b. 72 National Fire Alarm Code
 - c. 101 Life Safety Code (LSC)
 - d. 90A Standard for the Installation of Air Conditioning and Ventilating Systems
 - e. 13 Standard for the Installation of Sprinkler Systems.
 - f. 20 Standard for the Installation of Stationary Pumps for Fire Protection.
 6. Testing Services or Laboratories: Construct all fire alarm and fire detection equipment in accordance with the latest edition of the following publications from Underwriters Laboratories Inc. (UL), or Factory Mutual Engineering Corporation (FM):
 - a. UL 268 – Door Holding Devices
 - b. UL 464 - Audible Signal Appliances
 - c. UL 864 - Control Units for Fire Protective Signaling Systems
 - d. UL 1638 - Visual Signaling Appliances Standard
 - e. UL 1971 - Signaling Devices for the Hearing Impaired
 - f. UL Fire Protection Equipment Directory
 - g. UL Electrical Construction Materials Directory
 - h. FM P7825 Approval Guide
- B. The new fire alarm system shall interface with the existing building fire alarm system. The Contractor shall reprogram and retest the existing building fire alarm system.

- C. Fire alarm signal initiation shall be by one or more of the following devices:
1. Manual stations.
 2. Smoke detectors.
 3. Verified automatic alarm operation of smoke detectors.
 4. Automatic sprinkler system water flow.
- D. Fire alarm signal shall initiate the following actions:
1. Alarm notification appliances shall operate continuously.
 2. Identify alarm at the FACP and remote annunciators.
 3. De-energize electromagnetic door holders.
 4. Transmit an alarm signal to the remote alarm receiving station.
 5. Unlock electric door locks in designated egress paths.
 6. Release fire and smoke doors held open by magnetic door holders.
 7. Switch heating, ventilating, and air-conditioning equipment controls to fire alarm mode.
 8. Activate closure sequence of smoke dampers in air ducts of system serving zone where alarm was initiated.
 9. Record events in the system memory.
 10. Record events by the system printer.
 11. Transmission of a supervisory signal to the main building fire alarm system.
 12. The graphical annunciator panel shall allow the floor plan for the floor in alarm to "pop up" on the screen and shall show the location of the device in alarm.
- E. A supervisory signal shall automatically initiate the following functions:
1. Transmission of a supervisory signal to the Central Station.
 2. Visual indication of the device operated on the fire alarm control panel (FACP) and on the remote annunciator panel.
 3. Recording of the event via the system printer.
 4. Operation of a duct smoke detector shall shut down the appropriate air handler in accordance with NFPA 90A in addition to 1, 2 and 3 above.
 5. View location of device on floor plan at graphical annunciator panel.
- F. A trouble condition shall automatically initiate the following functions:
1. Transmission of a trouble signal to the Central Station.
 2. Visual indication of the system trouble on the FACP and on the remote annunciator panel.
 3. Recording of the event via the system printer.
 4. The maximum permissible elapsed time between the actuation of an initiating device and its indication at the FACP shall be ten (10) seconds.
 5. The maximum elapsed time between the occurrence of the trouble condition and its indication at the FACP shall not exceed two hundred (200) seconds.
 6. Audible and visible alarm notification devices shall be powered by separate circuits.
 7. View location of device on floor plan at graphical annunciator panel.
- G. System Trouble and Supervisory Signal Actions: Ring trouble bell and annunciate at the FACP and remote annunciator. Record the event on system printer.
- H. Live and pre-recorded voice announcements shall be broadcast via the main fire alarm panel located in the ground floor lobby.
- I. Annunciator panels shall be provided in both theatre areas.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Before any work is commenced, the Commissioner must approve the submittal. Manufacturer's data shall be annotated and provided for the following:
1. Manual Pull Stations
 2. Addressable Interface Devices
 3. Addressable Relays
 4. Speaker Units
 5. Combination Speaker/Strobe Units
 6. Visible Alarm Signal Strobes
 7. Smoke Detectors
 8. All Wiring Types and Sizes
 9. Conduit and Raceway
 10. Addressable Device Labels
 11. Waterflow Detectors
 12. Valve Supervisory Switches
 13. Remote Fire Alarm Control Units
 14. Duct Smoke Detectors and Remote LED indicators
 15. Polycarbonate Guards
- C. Shop Drawings
1. Shop Drawings shall be prepared by persons with the following qualifications:
 - a. Trained by manufacturer in fire alarm system design.
 - b. Fire alarm certified by NICET, minimum Level III.
 2. Shop Drawings: Submit shop drawings not smaller than 24" x 36". As a minimum, the shop drawing submittal shall include the following:
 - a. Provide point-to-point-wiring diagrams showing the points of connection and terminals used for all electrical field connections in the system, including all interconnections between the equipment or systems that are supervised or controlled by the system. Diagrams shall show all connections from field devices to the FACP and remote fire alarm control units, initiating circuits, switches, relays and terminals. Provide point to point wiring diagrams showing all internal panel wiring, connections, and jumper positions. Provide drawings showing device locations, terminal cabinet locations, and all circuit layouts for all floors. All addressable devices shall have their digital addresses indicated on the shop drawing at the appropriate location.
 - b. Provide a complete description of the system operation
 - c. Provide a complete list of device addresses and corresponding English language descriptors.
 - d. Include annotated catalog data showing manufacturer's name, model, voltage, and catalog numbers for all equipment and components.
 - e. Provide complete battery calculations for both the alarm and supervisory power requirements. Ampere-hour requirements for each system component shall be submitted with the calculations.
 - f. Provide complete riser diagrams indicating the wiring sequence of all devices and their connections to the control equipment.
 - g. Provide a color code schedule for the wiring.

- h. Provide floor plans showing the location of all devices and equipment.
 - i. Provide data on each circuit to indicate that there is at least 25% spare power capacity for visible notification appliances, 25% spare capacity for audible notification appliances, and 25% spare capacity for initiating device circuits.
 - j. Provide data to indicate that the system has sufficient capacity to simultaneously drive all fire alarm horns and speakers at their required sound output plus 25% spare capacity.
 - k. Provide voltage drop calculations for notification appliance circuits
 - l. Provide voice/alarm signaling service equipment rack or console layout, grounding schematic, amplifier power calculation, and single line connection diagram.
3. System Operation Matrix: The drawings shall show the sequence of fire alarm operations by providing an input/output matrix. The matrix shall incorporate the following information:
- a. System Inputs
 - 1) Manual fire alarm pull stations.
 - 2) Sprinkler waterflow switch.
 - 3) Valve supervisory switch.
 - 4) Duct smoke detectors.
 - 5) Area smoke detectors.
 - b. System Outputs
 - 1) Audible and Visible notification appliances and associated signals for entire building.
 - 2) Transmit "Fire Alarm" signal to Campus Central station.
 - 3) Transmit "Supervisory" signal to to Campus Central station.
 - 4) Transmit "Trouble" signal to to Campus Central station.
 - 5) Release fire doors hold opens.
 - 6) Override access control system for egress doors.
 - 7) Shut down respective air handling units.
 - 8) Print out event on fire alarm system printer.
 - 9) Display event on remote annunciator panel.
 - 10) Display specific device information and state on FACP.
 - 11) Display floor plan information on graphical annunciator panel.

1.6 OPERATION AND MAINTENANCE MANUALS

- A. General: Provide operation and maintenance manuals not less than fifteen days prior to the final acceptance testing of the entire system. The manuals shall be used during the instruction period hereinafter specified. Provide six bound copies of an Operation and Maintenance Manual. The manual shall include an index, copies of all approved shop drawings and submittal materials, and a complete parts list of all components. The manual shall also include, for each item, the manufacturer's name, the serial number of the part, an ordering number, if appropriate, and a physical and electrical description of the part. Following the final acceptance test, drawings and submittal materials shall be updated as necessary to reflect as-built conditions.

1.7 AS-BUILT DRAWINGS

- A. General: Prepare and submit to the Contracting Officer six sets of detailed "As Built Drawings." The drawings shall include complete wiring diagrams showing connections between all devices and equipment, both factory and field wired. Include a riser diagram and drawings showing the as-built location of all devices and equipment. The drawings shall show the system as installed, including all wiring and conduit runs, and all deviations from both the project drawings and the approved shop drawings. The drawings shall be prepared on uniform sized sheets not less than 24" x 36". These drawings shall be submitted within two weeks after the final acceptance test of the system
- B. Provide three (3) sets of all As-Built CAD based electronic drawings; each set shall include DWG, DWF, and DXF file formats, including all associated externally referenced electronic files (Xref's). These As-Built electronic files shall contain externally referenced files that have been inserted (do not Bind the Xref's). Provide all three versions (DWG, DWF & DXF) of electronic CAD based file formats on three (3) separate recordable CD-R's (do not use CD-RW's or DVD-R/RW's). These three (3) CD-R's shall be formatted, written to, and the recording session closed in such a manner as to prevent additional electronic file transfers to the recordable CD-R's. Refer to Division 1 for any additional requirements.
System Operation Description: Detailed description for this Project, including method of operation and supervision of each type of circuit and sequence of operations for manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.
- C. Device Address List: Coordinate with final system programming.
- D. System riser diagram with device addresses, conduit sizes, and cable and wire types and sizes.
- E. Wiring Diagrams: Power, signal, and control wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Show wiring color code.
- F. Batteries: Size calculations.
- G. Duct Smoke Detectors: Performance parameters and installation details for each detector, verifying that each detector is listed for the complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
- H. Ductwork Coordination Drawings: Plans, sections, and elevations of ducts, drawn to scale and coordinating the installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, the detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.
- I. Floor Plans: Indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.
- J. Qualification Data: The Contractor shall submit the following at time of proposed submission for verification of qualifications:

1. Submit documentation, to the Contracting Officer, showing that the Contractor has successfully installed multiplex/addressable fire alarm systems of comparable size, type and design as specified herein or that the Contractor has a firm contractual agreement with a Subcontractor having such experience. When a Subcontractor performs the work, the Contractor shall submit a copy of the subcontract to the Contracting Officer. The data shall include the names and locations of at least five installations where the Contractor, or if the work will be performed by a Subcontractor, the Subcontractor, installed such systems.
- K. Service Organization: The contractor shall furnish evidence that the fire alarm equipment supplier has an experienced and effective service organization that carries a stock of repair parts for the system to be furnished. Should the contractor fail to comply with the service requirements of this section, the government will then have the option to make the necessary repairs and back charge the contractor without any loss of warranty or guarantee as provided by the contract documents.
- L. Field Quality-Control Test Reports
- M. Submittals to Authorities Having Jurisdiction: In addition to distribution requirements for submittals specified in Division 1 DDC General Conditions, make an identical submittal to authorities having jurisdiction. To facilitate review, include copies of annotated Contract Drawings as needed to depict component locations. Resubmit if required to make clarifications or revisions to obtain approval. On receipt of comments from authorities having jurisdiction, submit them to the Commissioner for review.
- N. Documentation
 1. Approval and Acceptance: Provide the "Record of Completion" form according NPA 72 to the Commissioner and authorities having jurisdiction.
 - O. Record of Completion Documents: Provide the "Permanent Records" according to NFPA 72 to the Commissioner, and authorities having jurisdiction. Format of the written sequence of operation shall be the optional input/output matrix.
 - a. Hard copies on paper to and the Commissioner, and authorities having jurisdiction.
 - b. Electronic media may be provided to the Commissioner, and authorities having jurisdiction.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.9 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but not less than 1 unit.

2. Smoke and Fire Detectors: Quantity equal to 10 percent of amount of each type installed, but not less than 1 unit of each type.
3. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but not less than 1 unit of each type.
4. Keys and Tools: One extra set for access to locked and tamper proofed components.
5. Audible and Visual Notification Appliances: One of each type installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. FACP and Equipment: compatible with the existing building-wide fire alarm system.
 2. Wire and Cable:
 - a. Comtran Corporation.
 - b. Helix/HiTemp Cables, Inc.; a Draka USA Company.
 - c. Rockbestos-Suprenant Cable Corporation; a Marmon Group Company.
 3. Audible and Visual Signals:
 - a. Amseco; a division of Kobishi America, Inc.
 - b. Commercial Products Group.
 - c. Gentex Corporation.
- B. Circuits:
1. Signaling Line Circuits: NFPA 72, Class B, Style 4.
 - a. System Layout: Install no more than 50 addressable devices on each signaling line circuit.
 2. Notification-Appliance Circuits: NFPA 72, Class B, Style Y
 3. Actuation of alarm notification appliances, annunciation, and elevator recall, shall occur within 10 seconds after the activation of an initiating device.
 4. Electrical monitoring for the integrity of wiring external to the FACP for mechanical equipment shutdown and magnetic door-holding circuits is not required, provided a break in the circuit will cause doors to close and mechanical equipment to shut down
- C. Notification-Appliance Circuit: Operation for horns shall sound in a temporal pattern, complying with ANSI S3.41.
- D. Notification-Appliance Circuits: NFPA 72, Class B.

2.2 MANUAL FIRE ALARM BOXES

- A. Description: Provide metal, semi-flush mounted, double action, addressable manual stations, which are not subject to operation by jarring or vibration. Stations shall be equipped with screw terminals for each conductor. Stations that require the replacement of any portion of the device after activation are not permitted. Stations shall be finished in fire engine red with molded raised lettering operating instructions of contrasting color. The use of a key or wrench shall be required to reset the station. Provide UL listed weatherproof manual pull stations as noted on drawings.

2.3 SYSTEM SMOKE DETECTORS

A. General Description:

1. UL 268 listed, operating at 24-V dc, nominal.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
3. Multipurpose type, containing the following:
 - a. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
 - b. Piezoelectric sounder rated at 88 dBA at 3 m according to UL 464.
 - c. Heat sensor, combination rate-of-rise and fixed temperature.
4. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. Provide terminals in the fixed base for connection of building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type. Indicating detector has operated and power-on status.
7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.
 - a. Rate-of-rise temperature characteristic shall be selectable at the FACP for 8 or 11 deg C per minute.
 - b. Fixed-temperature sensing shall be independent of rate-of-rise sensing and shall be settable at the FACP to operate at 57 or 68 deg C.
 - c. Provide multiple levels of detection sensitivity for each sensor.

B. Photoelectric Smoke Detectors:

1. Photoelectric Smoke Detectors: Provide addressable photoelectric smoke detectors as follows:
 - a. Provide analog photoelectric smoke detectors utilizing the photoelectric light scattering principle for operation in accordance with UL 268. Smoke detectors shall be listed for use with the fire alarm control panel.
 - b. Provide self-restoring type detectors that do not require any readjustment after actuation to restore them to normal operation. Detectors shall be UL listed as Smoke-Automatic Fire Detectors.

- c. All components shall be rust and corrosion resistant. Vibration shall have no effect on the detector's operation. The detection chamber shall have a fine mesh metallic screen that prevents the entrance of insects or air born materials. The screen shall not inhibit the movement of smoke particles into the chamber.
- d. Provide twist lock bases for the detectors. The detectors shall maintain contact with their bases without the use of springs. Provide companion-mounting base with fixed wiring terminals. Terminate field wiring on the fixed terminals. The detector shall have a visual indicator to show actuation.
- e. Detectors shall be equipped with screw terminals for each conductor.
- f. The detector address shall identify the particular unit, its location within the system, and its sensitivity setting. Detectors shall be of the low voltage type rated for use on a 24 VDC system.
- g. Provide detectors that are rated for the air velocity expected

C. Ionization Smoke Detector:

1. Sensor: Responsive to both visible and invisible products of combustion. Self-compensating for changes in environmental conditions.
2. Detector Sensitivity: Between 0.0016 and 0.0056 percent/mm smoke obscuration when tested according to UL 268A.

D. Duct Smoke Detectors:

1. Photoelectric Smoke Detectors
2. Duct Smoke Detectors: Provide photoelectric type detectors as specified above.
 - a. Provide detectors with approved duct housing, mounted exterior to the duct, and with perforated sampling tubes extending across the width of the duct in accordance with NFPA 90A. For required return air duct detectors that are to be installed at the shaft openings where the return air enters the common return air shaft/system, provide quantities and proper location and spacing of detectors in compliance with NFPA 72 requirements.
 - b. Provide detectors that are rated for the air velocity expected. Coordinate with the Mechanical Contractor
 - c. Where the installed location of a duct detector is concealed or not easily located, provide a remote LED to indicate the operation and location of the detector.
3. UL 268A listed, operating at 24-V dc, nominal.
4. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
5. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. The fixed base shall be designed for mounting directly to the air duct. Provide terminals in the fixed base for connection to building wiring.
 - a. Weatherproof Duct Housing Enclosure: UL listed for use with the supplied detector. The enclosure shall comply with NEMA 250 requirements for Type 4X.
6. Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore them to normal operation.
7. Integral Visual-Indicating Light: LED type. Provide remote status and alarm indicator and test station where indicated.

8. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.
9. Each sensor shall have multiple levels of detection sensitivity.
10. Sampling Tubes: Design and dimensions as recommended by manufacturer for the specific duct size, air velocity, and installation conditions where applied.
11. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.4 NOTIFICATION APPLIANCES

- A. Description: Equipped for mounting as indicated and with screw terminals for system connections.
 1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly.
- B. Horns
 1. Provide surface mounted horn appliances listed under UL Standard 464. The device shall provide a synchronized temporal (Code3) horn (500 Hz). Sound output at 10 feet shall be field selectable for 90 or 95 dBA anechoic at 24 VDC for the temporal (Code 3) tone.
 2. To ensure audible signals are clearly heard, the sound level shall be at least 70 dBA throughout the office spaces, general building areas and corridors measured 5 feet above the floor. The sound level in other areas shall be at least 15 dBA above the average sound level or 5 dBA above any noise source lasting 60 seconds or longer. Sound levels shall be measured with room doors closed.
 3. Quantities of horn appliances shown on the contract drawings are for bidding only. Additional horn appliances shall be provided at no additional expense to the City of New York if the sound levels noted above are not achieved during the final acceptance testing.
- C. Multi-Candela Visible Alarm Appliances
 1. Provide visible alarm appliances (strobes) that operate on a supervised twenty-four (24) volt D.C. circuit. The strobe lens shall comply with UL 1971 and conform to the Americans with Disabilities Act. All strobes shall incorporate circuitry for synchronized strobe flash. The strobe intensity shall have a minimum of four field selectable settings and shall be rated per UL Standard 1971 for: 15, 30, 75 or 110 candela, with a flash rate of one flash per second minimum across the listed voltage range. The strobes shall not drift out of synchronization at any time during operation. The strobe shall have a xenon flash tube.

D. Multi-Candela Combination Audible/Visible Appliances

1. Provide surface mounted multi-candela combination horn/strobe or speaker/strobe appliances listed under UL Standard 1971 and UL Standard 464. All strobes shall incorporate circuitry for synchronized strobe flash. The device shall operate on a supervised twenty-four (24) volt D.C. circuit. The device shall be designed for 4-wire operation and shall provide a synchronized temporal (Code 3) horn and synchronized strobe. Sound output at 3m shall be field selectable for 100 dBA anechoic at 24 VDC for the temporal (Code 3) tone. The strobe intensity shall have a minimum of four field selectable settings and shall be rated per UL Standard 1971 for: 15, 30, 75 or 110 candela, with a flash rate of one flash per second minimum across the listed voltage range. The strobes shall not drift out of synchronization at any time during operation. The strobe shall incorporate a Xenon flash tube. The appliance shall also be designed so that the audible signal may be silenced while maintaining strobe activation.
2. To ensure audible signals are clearly heard, the sound level shall be at least 70 dBA throughout the office spaces, general building areas, and corridors measured 5 feet above the floor. The sound level in other areas shall be at least 15 dBA above the average sound level or 5 dBA above any noise source lasting 60 seconds or longer. Sound level measurements shall be taken with room doors closed.
3. Quantities of fire alarm horns and speakers shown on the contract drawings are for bidding only. Additional horns and speakers shall be provided at no additional expense to the City of New York if the sound levels noted above are not achieved during the final acceptance testing.

E. Mounting Plates

1. Provide mounting plates constructed of cold rolled steel having a minimum thickness of sixteen (16) gauge and equipped with mounting holes and other openings as needed for a complete installation. All fabricated marks and holes shall be ground and finished to provide a smooth and neat appearance for each plate. Each plate shall be primed and painted to match the color of the existing ceiling or wall fabrics.

F. Connections

1. Provide screw terminals for each notification appliance. Terminals shall be designed to accept the size conductors used in this project without modification.

2.5 GUARDS FOR PHYSICAL PROTECTION

- A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.

1. Factory fabricated and furnished by manufacturer of the device.
2. Finish: Paint of color to match the protected device.

- B. Provide polycarbonate guards where noted on drawings.

2.6 WIRE AND CABLE

- A. Wire and cable for fire alarm systems shall be UL listed and labeled as complying with NFPA 70, Article 760.
- B. Signaling Line Circuits: Twisted, shielded pair, not less than No. 18 AWG size as recommended by system manufacturer.

1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70 Article 760, Classification CI, for power-limited fire alarm signal service. UL listed as Type FPL, and complying with requirements in UL 1424 and in UL 2196 for a 2-hour rating. Conduits for Circuit Integrity cable shall be supported per the U.L. listing of cable. Contractor shall be familiar with the requirements of the U.L. listing for installation.
2. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.
3. Low-Voltage Circuits: No. 16 AWG, minimum.
4. Line-Voltage Circuits: No. 12 AWG, minimum.
5. Multiconductor Armored Cable: NFPA 70 Type MC, copper conductors, TFN/THHN conductor insulation, copper drain wire, copper armor with outer jacket with red identifier stripe, UL listed for fire alarm and cable tray installation, plenum rated, and complying with requirements in UL 2196 for a 2-hour rating.

2.7 VALVE SUPERVISORY (TAMPER) SWITCHES

- A. General: Provide valve supervisory switches for fire protection system control valves where indicated on the drawings. Valve supervisory switches shall be UL listed as "Extinguishing System Attachment" for the location and type of valve supervised. The device shall contain double pole, double throw contacts. Operation of the switch shall cause a supervisory signal to be transmitted to the FACP upon not more than two complete turns of the valve wheel or a closure of ten percent, whichever is less. Valve supervisory switches shall be equipped with screw terminals for each conductor.

2.8 WATERFLOW DETECTORS

- A. General: Provide a vane type waterflow detector. The device shall contain double pole, double throw contacts. Equip the detector with a pneumatic time delay, field adjustable from zero to ninety seconds. The time delay shall be set initially to 30 seconds. The device shall be a UL listed Extinguishing System Attachment rated for the particular pressure and location at which it is installed. Waterflow detectors shall be equipped with screw terminals for each conductor.

PART 3 - EXECUTION

3.1 SYSTEM FIELD WIRING

- A. Wiring Within Cabinets, Enclosures, Boxes, Junction Boxes and Fittings: Provide wiring installed in a neat and workmanlike manner and installed parallel with or at right angles to the sides and back of any box, enclosure or cabinet. All conductors that are terminated, spliced, or otherwise interrupted in any enclosure, cabinet, mounting or junction box shall be connected to terminal blocks. Mark each terminal in accordance with the wiring diagrams of the system. Make all connections with approved pressure type terminal blocks, which are securely mounted. The use of wire nuts or similar devices shall be prohibited.

- B. Alarm Wiring: Signaling line circuits and initiating device circuit field wiring shall be solid copper, No. 18 AWG size conductors at a minimum. Visible alarm signal and audible appliance circuits shall be solid copper No. 14 AWG size conductors at a minimum. The wiring sizes listed herein are minimum sizes. Use larger wire sizes when recommended by the manufacturer, based on actual system configurations. Wire size shall be sufficient to prevent voltage drop problems. Circuits operating at 24 VDC shall not operate at less than 21.6 volts. Circuits operating at any other voltage shall not have a voltage drop exceeding 10% of nominal voltage. Power wiring, operating at 120 VAC minimum, shall be No. 12 AWG solid copper having insulation rated for 600 volts. Install all conductors in rigid metal conduit or electrical-metallic tubing, utilizing compression type fittings and couplings, with a minimum diameter of 3/4" (19 mm). The use of flexible metal conduit not exceeding a 6-foot (1.8 meters) length shall be permitted in initiating device circuits. Run conduit or tubing concealed in finished areas unless specifically shown otherwise on the drawings. Conduit may be exposed in mechanical/electrical rooms, basement, mezzanine and penthouse levels. Shielded wiring shall be utilized where recommended by the manufacturer. For shielded wiring, the shield shall be grounded at only one point, which shall be in or adjacent to the FACP. T-taps are permitted in Style 4 circuits with interconnections occurring on terminal strips.
1. Where the fire alarm system is responsible for initiating an action in another emergency control device or system, such as an HVAC system or elevator system, the addressable fire alarm relay circuit shall terminate in terminal cabinets be within 3 feet (914 mm) of the controllers for those systems. The completion of those circuits from the terminal cabinets to the appropriate system shall be provided under this section.
 2. Conductor Terminations: No specific color coding is required for any circuit; however, labeling of any circuit at terminal blocks in terminal cabinets, FACP, and remote fire alarm control units shall be provided at each conductor connection. Each conductor or cable shall have a shrink-wrap label to provide a unique and specific designation. Each terminal cabinet, FACP and remote fire alarm control unit shall contain a laminated drawing that indicates each conductor, its label, circuit and terminal. The laminated drawing shall be neat, using 12 point lettering minimum size, and mounted within each cabinet, panel or unit so that it does not interfere with the wiring or terminals.

3.2 FIRESTOPPING

- A. General: Firestop all holes for conduit, piping, or other penetrations which pass through floor slabs, fire-rated walls, partitions with fire-rated doors, vertical service shafts, or any fire-rated assemblies in accordance with Division 7 "Firestops and Smoke-seals"

3.3 INSTALLATION OF FIRE ALARM INITIATING AND INDICATING DEVICES

- A. FACP: Locate the FACP on the level of fire department access where indicated on the drawings. Surface mount the enclosure with the top of the cabinet 6 ft. (1.8 meters) above the finished floor or center the cabinet at 5.25 ft. (1.6 meters), whichever is lower. All conductor terminations shall be labeled and a drawing containing all conductors, their labels, their circuits and their interconnection shall be permanently mounted in the FACP.
- B. Manual Pull Stations: Locate manual pull stations where shown on the drawings. Mount stations so that their operating handles are 54" (1371 mm) above the finished floor in areas that allow parallel wheelchair access, and no more than 48" (1220 mm) above the finished floor in areas that allow only perpendicular wheelchair access
- C. Notification Appliances: Locate notification appliance devices where shown on the drawings. Mount assemblies as follows:

1. Fire Alarm Horns shall be flush, wall mounted and meet the requirements of NFPA 72. Horn appliances installed outdoors shall be UL listed for outdoor use.
2. Multi-Candela Combination Speaker/Visible Appliances shall be flush, wall mounted and meet the requirements of NFPA 72.
3. Visible Strobe Appliances shall be flush and meet the requirements of NFPA 72.
4. Smoke Detectors: Locate detectors as shown on the drawings on a 100 mm (4") mounting box. Detectors located on the ceiling shall be installed not less than 100 mm (4") from a sidewall to the near edge. Those located on the wall shall have the top of the detector at least 100 mm (4") below the ceiling, but not more than 300 mm (12 inches) below the ceiling. In the case of solid joist construction, the detectors shall be mounted on the bottom of the joists. On smooth ceilings, detectors shall be installed not over 9.1 meters (30 ft.) apart in any direction. Closer spacing shall be used when recommended by the detector manufacturer or required by NFPA 72. Install smoke detectors no closer than 1.5 meters (5 ft.)
5. Water Flow Detectors and Valve Supervisory Switches: Locate water flow detectors and valve supervisory switches where shown on the drawings at each supervised sprinkler valve station.

3.4 ADDRESSABLE DEVICE LABELING

- A. Each addressable device shall be labeled with permanent labels indicating the device's digital address. Labels shall have ½ inch letters with the following color scheme: red devices shall have red letters on a white background; devices of other colors shall have black letters on a white or clear background providing adequate contrast so as to be read easily. Ceiling mounted devices shall be labeled on two sides of the base. Labels shall be in accordance with the following requirements:
1. Manual pull stations shall have a ½ inch label stating the digital address of the device. Mount label at top of pull station.
 2. Detector bases shall be labeled on two sides with ½ inch labels so persons traversing corridors or spaces searching for the device can see labels. Label shall have digital address on it.
 3. Duct detector housing and remote indicator shall be labeled with ½ inch labels so persons traversing spaces searching for the device can see labels. Label shall have digital address on it.
 4. Addressable Interface Devices shall be labeled with ½ inch labels with each device's digital address.

3.5 TESTS

- A. Refer to Division 1 DDC General Conditions on General for commissioning requirements for Fire Alarm, and Sprinkler Testing Protocol Matrix.
- B. Loop Resistance Tests: Measure and record the resistance of each circuit with each pair of conductors in the circuit short-circuited at the farthest point from the circuit origin. The tests shall be witnessed by the Commissioner, and test results recorded for use at the final acceptance test.
- C. Loop Capacitance Tests: Measure and record the capacitance of each signaling line circuit. Measure capacitance between +loop and -loop, between +loop and chassis, and between -loop and chassis. The tests shall be witnessed by the Commissioner, and test results recorded for use at the final acceptance test.

- D. Preliminary Testing: Conduct preliminary tests to ensure that all devices and circuits are functioning properly. Tests shall meet the requirements of Paragraph 3.7 of this section. Correct any deficiencies, omissions or anomalies and retest the affected devices to assure proper function per the specification. After all preliminary testing is complete, provide a letter certifying that the installation is complete and fully operable. The letter shall state that each initiating and indicating device was tested in place and functioned properly. The letter shall also state that all panel functions were tested and operated properly. The letter shall include the names and titles of the witnesses to the preliminary tests. The Contractor and an authorized representative from each supplier of equipment shall be in attendance at the preliminary testing to make necessary adjustments.
- E. Final Testing: Notify the Contracting Officer in writing when the system is ready for final acceptance testing. Submit request for test at least 15 calendar days prior to the test date. A final acceptance test will not be scheduled until the O&M Manuals are provided to the Contracting Officer and the following are provided at the job site:
1. Marked-up red line drawings of the system as actually installed
 2. Loop resistance test results and loop capacitance test results
 3. Complete program printout including all input/output addresses
 4. The Contractor shall provide all personnel, equipment, tools, meters, ladders, and communication devices necessary for the performance of all tests. Materials such as simulated smoke, extension poles for introducing smoke into detectors, etc. shall be provided entirely by the Contractor.

3.6 MINIMUM SYSTEM TESTS

- A. General: Test the system in accordance with the procedures outlined in NFPA 72. The required tests are as follows:
1. Verify the absence of unwanted voltages between circuit conductors and ground. The tests shall be accomplished at the preliminary test with results available at the final acceptance test.
 2. Verify that the control unit is in the normal condition as detailed in the manufacturer's operating and maintenance manual.
 3. Test each initiating and indicating device and circuit for proper operation and response at the control unit. Use of magnets to trip smoke detectors or other initiating devices in lieu of a functional test of the detector is not acceptable.
 4. Test the system for all specified functions in accordance with the contract drawings and specifications and the manufacturer's operating and maintenance manual.
 5. Test sound pressure levels (dBA slow) and intelligibility throughout the building to assure specified decibel levels are achieved by the horns and intelligibility levels achieved by the speakers. Measure sound levels at 1.5 m (5 ft.) above finished floor with the room doors closed.
 6. Determine that the system is operable under trouble conditions as specified.
 7. Visually inspect all wiring.
 8. Verify that all software control and data files have been entered or programmed into the FACP. Hard copy records of the software shall be provided to the Contracting Officer.
 9. Verify that redline drawings are accurate.
 10. Measure the current in circuits to assure there is the calculated spare capacity for the circuits.
 11. Measure voltage readings for circuits to assure that voltage drop is not excessive.
 12. Measure the voltage drop at the most remote appliance on each notification appliance circuit.
 13. Retest existing fire alarm system.

3.7 SPARE PARTS AND TOOLS

- A. Interchangeable Parts: All spare parts furnished shall be directly interchangeable with the corresponding components of the installed system. Spare parts shall be suitably packaged and identified by nameplate, tagging, or stamping. Spare parts shall be delivered to the Commissioner.
- B. Spare Parts: Provide the following spare parts and accessories:
1. 4 Combination horn/strobe appliances
 2. 4 Independent Horn appliances
 3. 4 Independent strobe appliances
 4. 4 Manual fire alarm (pull) station
 5. 4 Waterflow switches with interface modules
 6. 4 Tamper switches with interface module
- C. Parts List: Furnish a list, in duplicate, of all other parts and accessories that the manufacturer of the system recommends to be stocked for maintenance.

END OF SECTION 28 31 11

FMS ID: PV467ANYC



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

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

Contract for Furnishing all Labor and Material Necessary and Required for:

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- CONTRACT NO. 2 PLUMBING WORK
- CONTRACT NO. 3 HVAC + FIRE PROTECTION WORK
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