



George Latimer, Westchester County Executive

**General Requirements and Proposals
Information for Bidders
General and Special Clauses
Technical Specifications**

TITLE

**INFRASTRUCTURE REHABILITATION – PHASE 3
PLAYLAND PARK
RYE, NEW YORK**

VOLUME 1

**Contract No. 22-523
Bid Opening: October 5, 2022**

By Bidder (Please Print)	For Official Use Only
Firm/Business Name: _____ Address: _____ _____	_____ _____

**DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION
Division of Engineering**

SPECIAL NOTICE

County of Westchester
New York

SEPARATE CONTRACTS

The bidders are hereby notified that there are/will be multiple separate County Construction Contracts running concurrently with Contract 22-523, they are, but not limited to:

Contract 21-541

Emergency Infrastructure Work, Restroom Facilities and South Administration Building

Contract 21-542

Emergency Infrastructure Work, Playland Towers, North Administration Building and West Cross Axis Food Facilities

Contract 20-530

Infrastructure Rehabilitation – Phase 2

Contract 20-531

Site Improvements

Therefore:

A. Each Contractor's attention is specifically directed to the fact that, because of the work of other contracts within and adjacent to the limits of this Contract they may not have exclusive occupancy of the territory within or adjacent to the limits of this Contract.

B. Each Contractor shall be required to cooperate with other Contractors to arrange the sequence of their work to conform to the progressive operations of the work already under contract and to be put under contract.

SEPARATE CONTRACTS (Continued)

C. Each Contractor shall be responsible for the coordination of the work of their various subcontractors. Their respective operations shall be arranged and conducted so that delays will be avoided. Where the work of a Contractor or subcontractor overlaps or dovetails with that of other Contractors, materials shall be delivered and operations conducted so as to carry on the work continuously in an efficient and workmanlike manner. Delays or oversights on the part of a Contractor or his subcontractors in getting any or all of their work done in the proper way thereby causing cutting, removing and replacing work already in place, shall not be the basis for claim for extra compensation.

D. In case of interference between the operations of different Contractors, the Construction Administrator will be the sole judge of the rights of each Contractor and the sequence of work necessary to expedite the completion of the entire project, and in all cases the Construction Administrator's decision shall be accepted as final.

SPECIAL NOTICE

County of Westchester
New York

ADDENDA TO THE BID DOCUMENTS

Addenda to the Bid Documents will be published on the Empire State Purchasing Group website at (<http://www.bidnetdirect.com/new-york>) **It is the responsibility of each potential bidder to check the website on a regular basis for further information relative to the bid documents including information relating to any and all addenda** prior to submitting its bid. All Bidders are deemed to have reviewed and considered all addendums in their Bid.

SUBMISSION OF BIDS

Bidders should not submit the entire bid document with its bid submission. Instead, each bidder is required to submit the full set of designated Proposal Pages. The Proposal Pages are denoted by a border and are titled on the bottom as “Proposal Page ____”. The Proposal Pages must be accompanied by the “Bid Bond and Consent of Surety” (as set forth in the Proposal Pages) attached to the outside of the sealed bid. A Bid Bond is NOT required for contracts of \$100,000 or less. Failure to submit in this manner may cause the bid to be rejected.

The successful bidder will be required to furnish a Performance and Payment Bond.

SPECIAL NOTICE

County of Westchester
New York

MANDATORY PRE-BID SITE INSPECTION

- A. Superseding the first paragraph of Article “3. PRE-BID SITE INSPECTION” of the Information for Bidders, Bidders are required to attend a Mandatory Pre-Bid Site Inspection at 10:00 a.m. Wednesday September 14, 2022 at a meeting outside by the Fountain Plaza directly adjacent to the Administration Building, Playland Park, Rye, New York, at which time they will examine the work site under escort by the County’s representative.

BIDS FROM CONTRACTORS NOT IN ATTENDANCE AT THIS MEETING, OR THOSE WHO FAIL TO SIGN THE ATTENDANCE SHEET-WILL BE REJECTED

- B. Bidders shall indicate their interest in the Mandatory Pre-Bid Site Inspection by contacting James Antonaccio, Department of Public Works and Transportation, Division of Engineering at (914) 995-6343.
- C. All other portions of Article “3. PRE-BID SITE INSPECTION” of the Information for Bidders shall remain in full force and effect.

REQUESTS FOR INFORMATION

All requests for information shall be directed in writing to Dianne Pohlsander at The LiRo Group, pohlsanderd@liro.com with a copy to James Antonaccio, JPA4@westchestergov.com no later than 1:00 P.M. on Wednesday, September 28, 2022.

SPECIAL NOTICE

County of Westchester
New York

**JOINT VENTURES OR CONTRACTORS COMPRISED OF MORE THAN ONE
LEGAL ENTITY**

(a) If the Contractor is a joint venture or otherwise comprised of more than one legal entity or any group of partners, participants or joint ventures associated for the purpose of undertaking this agreement, each such entity, partner and/or participant acknowledges and hereby affirmatively represents and agrees that each has the power to bind the Contractor and each of the others hereunder; and as such, each acts both as principal and agent of the Contractor and of each of the others hereunder. Each further acknowledges and agrees that all such entities, participants and/or partners of the joint venture associated for the purposes of undertaking this agreement expressly agree to be jointly and severably liable for any and all obligations and/or liabilities of the Contractor arising in any way out of and in connection with this agreement.

(b) If the Contractor is a joint venture, or otherwise comprised of more than one legal entity or any group of partners, participants or joint ventures associated for the purposes of undertaking this agreement, the Contractor represents and warrants to the County that it is duly organized under the laws of the State of New York, and that each and every entity, partner, participant or joint venture of Contractor agrees to separately execute the agreement, by its own authorized representative, with the appropriate acknowledgment and verification.

(c) If the Contractor is a joint venture or otherwise comprised of more than one legal entity or any group of partners, participants or joint ventures associated for the purpose of undertaking this agreement, either at least one such entity, partner and/or participant comprising the Contractor and on behalf of the Contractor or the Contractor itself, shall comply with all requirements of the bid specifications herein and prerequisites to submit a bid, including but not limited to attendance of any mandatory pre-bid meetings, if any, and obtaining the bid documents and any addenda from the Empire State Purchasing Group website, or any successor website for posting of bid documents.

(d) If the Contractor is a joint venture or otherwise comprised of more than one legal entity or any group of partners, participants or joint ventures associated for the purposes of undertaking this agreement, each such entity, partner and/or participant acknowledges and hereby affirmatively represents and agrees that the respective rights, duties and liabilities of each hereunder shall be governed by the laws of the State of New York, including but not limited to the New York Partnership Law.

SPECIAL NOTICE

County of Westchester
New York

MINORITY PARTICIPATION POLICY

Contractors must comply with the County's Minority Participation Policy, including, but not limited to, the requirement that contractors make a demonstrated good faith effort to utilize Minority Owned Businesses ("MOB") and Women Owned Businesses ("WOB") (see IFB Article 36). To assist contractors in this effort the County has made available a list of MOB and WOB at <https://business.westchestergov.com/mwbe> Contractors are also encouraged to utilize other sources to identify potential MOB and WOB as subcontractors and suppliers.

All bidders must submit as part of their bid package the Minority/Women Owned Business Enterprise Questionnaire located in the Proposal Page section of the bid documents.

SPECIAL NOTICE

County of Westchester
New York

CHANGES IN THE WICKS LAW

Effective July 1, 2008, construction contracts of one million five hundred thousand dollars or less will not require the preparation of separate contracts for plumbing and gas fitting; steam heating, hot water heating, ventilation and air conditioning apparatus; and electric wiring and standard illuminating fixtures and general construction.

Each bidder on a public work contract, where the preparation of separate contracts is not required shall, to the full extent applicable, submit with its bid a separate sealed list that names each Subcontractor that the bidder will use to perform work on the contract and the agreed upon price to be paid to each for (a) plumbing and gas fitting, (b) steam heating, hot water heating, ventilating and air conditioning apparatus and (c) electric wiring and standard illuminating fixtures and (d) general construction. The submission (Proposal Page 6) that contains the agreed upon price shall be acknowledged by both Contractor and Subcontractor. For purposes of this paragraph, the acknowledgment from the Subcontractor may contain the facsimile signature of an officer of the Subcontractor.

After the low bid is announced, the sealed list of subcontractors submitted with the bid shall be opened and the names of such subcontractors shall be announced. Thereafter, any changes of subcontractors or agreed-upon amount to be paid to each shall require the approval of the County upon a showing of legitimate construction need for such change.

The Successful low bidder, before award of the contract, must procure and provide to the County, from each of the above denoted Subcontractors, a Contract Disclosure Statement and the Required Disclosure of Relationships to County forms.

The sealed lists of Subcontractors submitted by unsuccessful bidders shall be destroyed after the contract award.

THIS PROJECT IS NOT SUBJECT TO THE REQUIREMENTS OF THE “WICKS LAW”. ACCORDINGLY, EACH BIDDER IS REQUIRED TO SUBMIT SPECIFIC INFORMATION PERTAINING TO ITS PROPOSED SUBCONTRACTORS. PLEASE SEE THE “NOTICE TO CONTRACTORS” THAT FORMS A PART OF THESE BID DOCUMENTS.

SPECIAL NOTICE

County of Westchester
New York

COMPLETION OF GRANT FUNDING FORMS

The bidders are hereby notified that if this project, or any portion thereof, is funded by a grant then the contractor will be responsible to complete all appropriate forms as required by the grant agency in order to complete the application.

PROMPT EXECUTION AND RETURN OF CONTRACT

- A. The successful bidder is required to return the completed contract to the County within ten (10) days of receipt of the execution copy of the contract. The contract must be signed, notarized and returned to the County with all insurance certificates, bonds and supporting documentation, including all required Subcontractor information.
- B. The County reserves all of its rights, including, but not limited to, proceeding against the bid bond, if the successful bidder fails to submit the complete executed package within the above time frame.

SPECIAL NOTICE

County of Westchester
New York

**PROOF OF PAYMENT BY CONTRACTOR TO SUBCONTRACTORS
AND MATERIALMEN.**

In addition to and without limiting any of the provisions set forth in Section 23 of the Information for Bidders, after the Contractor completes 50% of the work under the contract, the Contractor shall supplement each requisition submitted to the County with documentation that establishes that the Contractor has timely and properly paid its subcontractors and materialmen as required by Section 23 of the Information For Bidders. Such documentation shall include copies of both sides of cancelled check(s) paid to the order of the subcontractors and materialmen and such other documentation as may be reasonably requested by the Commissioner. If the Contractor fails to submit such documentation, the Commissioner may, in his sole discretion, withhold payment of the requisition until such time as the documentation is properly submitted. Nothing herein is intended or shall be construed to confer upon or give any subcontractor or materialman, or its successors and assigns, any third party beneficiary rights, remedies or basis for reliance upon, under or by reason of the contract or this Special Notice provision.

SPECIAL NOTICE

County of Westchester
New York

PREVAILING WAGE

All public works contracts are subject to the payment of the prevailing wage and supplements as set forth by the laws of the State of New York, including, but not limited to, Articles 8 and 9 of the New York Labor Law (the “Prevailing Wage Laws”). Westchester County has an active Prevailing Wage Enforcement Officer who enforces the Prevailing Wage Laws within the County for public works contracts, including reviewing certified payroll records, visiting job sites, interviewing the employer and employees (See IFB Article 12) and, if necessary, requesting copies of cancelled checks.

Any Contractor who fails to comply with the Prevailing Wage Laws, including, but not limited to, failing to pay the prevailing wage rates and supplements, failing to submit certified payroll records to the County or failing to post the prevailing wage rates and supplements at the work site, will be subject to enforcement as provided for in the Contract and laws of the State of New York through the Westchester County District Attorney’s office, the Commissioner of the New York State Department of Labor, the County and/or the employee who suffered the underpayment. This enforcement could include, but is not limited to, criminal penalties, civil penalties, debarment from future bid awards, the withholding of payment under the Contract to satisfy the unpaid wages and supplements, including interest and civil penalty. In addition, such a failure shall constitute grounds for cancellation of the Contract (IFB 8(C)). Moreover, a prime contractor is responsible for its subcontractor’s failure to comply with, or evasion of, the provisions of the Prevailing Wage Laws.

SPECIAL NOTICE

County of Westchester
New York

PROJECT LABOR AGREEMENT (PLA)

- A. The County of Westchester has determined that a Project Labor Agreement will be used on this Project. The successful bidder will be required as a condition of this Contract to execute the PLA with the Building and Construction Trades Council of Westchester and Putnam Counties, New York, AFL-CIO ("Council"). The PLA will be substantially in the same form as the PLA included in this contract specification book. Bidders are urged to familiarize themselves with the terms and conditions of the PLA.
- B. It should be noted that Schedule A of the PLA contains a list of the local unions affiliated with the Council. Copies of the applicable Collective Bargaining Agreements of the local unions can be obtained by writing to the Building and Construction Trades Council of Westchester and Putnam Counties, New York, AFL-CIO at 258 Saw Mill River Road, Elmsford, New York 10523, Attn.: Carol A. Boccardi.

SPECIAL NOTICE

County of
Westchester New
York

MANDATORY OSHA CERTIFICATION

When a public works contract is in excess of \$250,000.00, all employees are required to have successfully completed the OSHA 10 hours training class. All contractors and subcontractors must attach copies of proof of completion of the OSHA 10 hour course by all employees to the first certified payroll submitted to the County and on each succeeding payroll where any new or additional employee is first listed. Employees may be requested by the County's representative to verify compliance with the OSHA 10 hour course by showing their OSHA card.

When a public works contract is in excess of \$1,000,000.00, all employees are required to have successfully completed the OSHA 30 hours training class. All contractors and subcontractors must attach copies of proof of completion of the OSHA 30 hour course by all employees to the first certified payroll submitted to the County and on each succeeding payroll where any new or additional employee is first listed. Employees may be requested by the County's representative to verify compliance with the OSHA 30 hour course by showing their OSHA card.

In addition, on any contract that includes excavation of underground facilities, the excavator is required to be certified and have completed the training and education program provided by the one-call notification system (Dig Safely New York, Inc. Certified Excavator Program in Safe Digging Best Practices) or any other provider authorized by the public service commission to administer such training and education program.

NOTICE TO CONTRACTORS

County of Westchester
New York

Sealed proposals for the following construction work:

CONTRACT NO: 22-523

ADVERTISING: September 2, 2022

MANDATORY PRE-BID INSPECTION: September 14, 2022

INFRASTRUCTURE REHABILITATION –PHASE 3 PLAYLAND PARK RYE, NEW YORK

will be received by the Board of Acquisition and Contract in Room 528, Michaelian Office Building, 148 Martine Ave., White Plains, New York until 11:00 a.m., **Wednesday, October 5, 2022**, and immediately thereafter, the bids will be publicly opened and read aloud in Room 527 of the said building. The bid opening also will be made accessible to the public via the livestreaming service WebEx. The livestreaming of the bid opening via WebEx is in addition to and not in place of the publicly bid opening to be held in Room 527 of the Michaelian Office Building. For additional bidding information or questions call (914) 995-2274.

Instructions for livestreaming via WebEx. Attendees may join by computer browser at <https://westchestergov.webex.com/meet/bac-bidopening> or by phone 1-415-655-0001 US Toll or 1-844-621-3956 US Toll Free. The Access Code is 614 981 028.

The Bid Documents (General Requirements, Information for Bidders, Technical Specifications, etc. with Authorized Proposal Pages) **MUST BE OBTAINED from the Empire State Purchasing Group website at the following web address:**

<http://www.bidnetdirect.com/new-york>.

There is no cost to the bidder for this service. Bid documents will be available after 1:00 p.m. on the advertising date.

PLEASE TAKE NOTICE: IN ORDER TO SUBMIT A BID, BIDDERS MUST REGISTER AND DOWNLOAD THE BID DOCUMENTS FROM THE EMPIRE STATE PURCHASING GROUP WEBSITE AND MUST REGISTER USING THE NAME OF THE PERSON OR BUSINESS ENTITY THAT WILL BE SUBMITTING THE BID. IN ORDER TO ENSURE THAT COUNTY BID DOCUMENTS HAVE NOT BEEN ALTERED IN ANY WAY, THE COUNTY WILL NOT ACCEPT BIDS FROM PERSONS OR BUSINESS ENTITIES THAT HAVE NOT FOLLOWED THIS REQUIREMENT.

The Bid Documents include Contract Drawings which **MAY BE OBTAINED at no cost on the Empire State Purchasing Group website at the following web address:** <http://www.bidnetdirect.com/new-york>, after 1:00 p.m. on the advertising date.

If the bidder is unable to utilize the electronic version of the Contract Drawings that are available on the Empire State Purchasing Group Website, the bidder may purchase copies of the Contract Drawings. Contract Drawings may be obtained from the Office of the Board of Acquisition and Contract at the above address after 1:00 p.m. on the advertising date and between the hours of 9:00 a.m. to 4:00 p.m. Monday thru Friday. Copies of the Contract Drawings shall be made available upon payment of a personal check, company check or money order made payable to the County of Westchester, in the amount of **\$100.00** per set. For bidders, the deposit for each set of drawings will be refunded in full if returned in good condition within thirty days after award or rejection of bids. For non-bidders, only fifty percent of the deposit will be refunded. No refunds will be made to the successful bidder.

Each bidder is required to submit the full set of authorized Proposal Pages and all bids over **\$100,000.00** must also be accompanied by the "Bid Bond and Consent of Surety" (as set forth in the Proposal Pages) attached to the outside of the sealed bid. Failure to submit in this manner may cause the bid to be rejected. **The successful bidder, no matter the amount of its bid, will be required to furnish a Performance and Payment Bond with its signed contract.**

To the full extent applicable, each bidder shall submit with its bid a separate sealed list that names each Subcontractor that the bidder will use to perform work on the contract and the agreed upon price to be paid to each for: (a) plumbing and gas fitting, (b) steam heating, hot water heating, ventilating and air conditioning apparatus

and (c) electric wiring and standard illuminating fixtures and (d) general construction. The submission (Proposal Page 41) that contains the agreed upon price shall be acknowledged by both Contractor and Subcontractor. For purposes of this paragraph, the acknowledgment from the Subcontractor may contain the facsimile signature of an officer of the Subcontractor.

The Successful low bidder, before award of the contract, must obtain and provide to the County, from each of the above denoted Subcontractors, fully completed and signed Contract Disclosure Statement (Proposal Pages 24-32) and Required Disclosure of Relationships to County (Proposal Pages 33) forms.

The sealed lists of Subcontractors submitted by unsuccessful bidders shall be destroyed, unless you request that it be returned by checking the applicable box on Proposal Page 5.

The County of Westchester reserves the right to waive any informalities in the bids, or to reject any or all bids. No bidder may withdraw its bid within forty-five (45) days after the date of the bid opening.

Pursuant to Chapter 308 of the Laws of the County of Westchester, it is the goal of the County to use its best efforts to encourage, promote, and increase the participation of business enterprises owned and controlled by persons of color or women - Minority Business Enterprise (MBE) and Women Business Enterprise (WBE).

REMINDER: All required licenses should be submitted with the Bid.

COUNTY OF WESTCHESTER, NEW YORK
DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

BY: Hugh J. Greechan, Jr., P.E., Commissioner

TABLE OF CONTENTS

SECTION 1: GENERAL REQUIREMENTS AND PROPOSALS

General Requirements

1.	Description Of The Work	1.1
2.	Subcontracting & Direct Employment Of Labor	1.2
3.	Required Time For Completion Of The Work	1.2
4.	Security Regulations	1.3
5.	Payment for Bonds and Insurance	1.5
6.	Item W851 – Testing of Materials and Field Testing Equipment.....	1.6
7.	Additional Insurance Requirements	1.7

Contract Drawings

Contract Drawings	Contract Drawings 1
-------------------------	---------------------

Proposal Forms

Bidder's Identification.....	Proposal Page 1
Proposal Requirements and Addendum Receipt.....	Proposal Page 2
Non-Collusive Bidding Certification	Proposal Page 4
Bid Page(s).....	Proposal Page 6
Contractor's Acknowledgement.....	Proposal Page 7
Contractor's Acknowledgement (Corporation/Sole Officer).....	Proposal Page 8
Limited Liability Company Acknowledgement	Proposal Page 9
Certificate of Authority	Proposal Page 10
Certificate of Authority-Limited Liability Company	Proposal Page 11
Bid Bond and Consent of Surety	Proposal Page 12
Affirmative Action Program Requirement (Contractors).....	Proposal Page 13
Apprenticeship Training Program Requirement.....	Proposal Page 14
Certificate of License (Electrical).....	Proposal Page 15
Certificate of License (Plumbing).....	Proposal Page 17
Certificate of License (Hauler)	Proposal Page 19
Stormwater Pollution Prevention Certification.....	Proposal Page 20
Prevailing Wage Rates and Supplement	Proposal Page 21
MBE/WBE Program Questionnaire	Proposal Page 22
Contractor Disclosure Statement	Proposal Page 23
Required Disclosure of Relationships to County	Proposal Page 32
Service-Disabled Veterans-Owned Business Questionnaire	Proposal Page 34
Schedule "F" Criminal Background Disclosure	Proposal Page 35
Subcontractors Sealed Bid Submission.....	Proposal Page 41

TABLE OF CONTENTS

SECTION 2: INFORMATION FOR BIDDERS

1.	Addenda And Interpretation	2.1
2.	Voided Clauses	2.1
3.	Pre-Bid Site Inspection	2.1
4.	Bid Security	2.1
5.	Performance And Payment Bond.....	2.2
6.	Indemnification Agreement	2.3
7.	Insurance Requirements.....	2.3
8.	Prevailing Wage Rates And Supplements	2.6
9.	Labor And Compliance With Labor Law	2.9
10.	Contractor's Report Of Employment And Weekly Affidavit	2.13
11.	Laws/Regulations And Appropriations.....	2.13
12.	Refusal To Answer Questions	2.13
13.	Bid Requirements.....	2.14
14.	Miscellaneous Additional Work (Item W-800)	2.14
15.	Correction Of Errors	2.15
16.	Shown Quantities	2.15
17.	Qualification Of Bidders.....	2.15
18.	Required Experience.....	2.16
19.	Increase Or Decrease Of Quantities: Elimination Of Items.....	2.16
20.	Breakdown Cost Of Lump Sum Items And Contracts.....	2.16
21.	Engineering Charges.....	2.17
22.	Estimates And Payments.....	2.17
23.	Payments To Subcontractors And Materialmen By Contractor	2.21
24.	Time Of Starting	2.22
25.	Safety And Health Regulations For Construction And Demolition Work	2.22
26.	Accident Prevention And First Aid Facilities	2.23
27.	Fire Prevention And Control.....	2.23
28.	State And Local Sales Tax Exemption	2.24
29.	Apprentices	2.24
30.	Affirmative Action Provision	2.24
31.	Affirmative Action Program Requirement	2.24
32.	Authority To Do Business In New York	2.25
33.	License Requirements (Electrical).....	2.25
34.	License Requirements (Plumbing).....	2.26
35.	License Requirements (Haulers).....	2.27
36.	Minority Participation Policy.....	2.30
37.	Sexual Harassment Policy.....	2.32
38.	Smoke-Free Workplace Policy	2.33
39.	County Energy Efficient Purchasing Policy	2.33
40.	Restriction On Use Of Tropical Hardwoods.....	2.33
41.	Disclosure Of Relationships To County	2.34
42.	Contractor Disclosure Statement	2.34
43.	Criminal Background Information.....	2.34
44.	Mandatory OSHA Construction Safety And Health Training.....	2.36

TABLE OF CONTENTS

SECTION 3: GENERAL CLAUSES

1.	Material And Workmanship	3.1
2.	Definitions.....	3.1
3.	Boundaries Of Work.....	3.2
4.	Overlapping Work	3.2
5.	Proper Method Of Work And Proper Materials	3.4
6.	Control Of Area	3.5
7.	Permits, Fees, Etc.....	3.5
8.	Traffic	3.5
9.	Inspection.....	3.5
10.	Stopping Work.....	3.5
11.	Dimensions	3.6
12.	Payments To County.....	3.6
13.	Protection Of Utilities And Structures.....	3.6
14.	Protection Of Water Resources & The Environment	3.6
15.	Sanitary Regulations	3.8
16.	Cleaning Up	3.8
17.	Prevention Of Dust Hazard.....	3.8
18.	Representative Always Present.....	3.9
19.	Work In Bad Weather	3.9
20.	Protection Of Work Until Completion.....	3.9
21.	Removal Of Temporary Structures And Cleaning Up.....	3.9
22.	Gross Loads Hauled On Highway	3.9
23.	Concrete Batch Proportions - Yield.....	3.9
24.	Damage Due To Contractor's Operations	3.10
25.	Property Damage	3.10
26.	Claims For Damages.....	3.10
27.	Extensions Of Time	3.11
28.	Request For Approval Of Equal	3.12
29.	Substitution	3.15
30.	Extra Work: Increased Compensation/Decreased Work: Credit To The Owner.....	3.18
31.	Disputed Work - Notice Of Claims For Damages	3.20
32.	Contractor's Subcontracts And Material Lists	3.21
33.	Assignment Of Contract	3.22
34.	Payment For General Provisions	3.22
35.	Costs Incurred By County.....	3.22
36.	Guarantee Of Work.....	3.23
37.	Separate Contracts	3.23
38.	Cooperation With Owner.....	3.24
39.	Job Meetings & Project Superintendant	3.24

TABLE OF CONTENTS

SECTION 3: GENERAL CLAUSES

40.	Patent Warranty	3.25
41.	Materials	3.26
42.	Standard Of Quality	3.29
43.	Proprietary Item	3.29
44.	Shop Drawings.....	3.30
45.	Sequence Of Construction Operations.....	3.34
46.	Protection	3.36
47.	Cleanup And Removal Of Debris	3.36
48.	Temporary Service.....	3.36
49.	Operating Tests	3.37
50.	Operating Instructions And Parts Lists	3.37
51.	Cutting And Patching.....	3.37
52.	Conflicts Among Contract Documents.....	3.39
53.	Record Drawings	3.39
54.	Time	3.40
55.	Acceleration Of The Work.....	3.40
56.	Ultra Low Sulfur Diesel Fuel.....	3.40
57.	Qualified Transportation Fringe Program.....	3.42
58.	Use of Fluorescent Light Bulbs & Energy Efficient Bulbs	3.42
59.	County of Westchester Phosphorus-Free Lawn Fertilizer Policy.....	3.42

TABLE OF CONTENTS

SAMPLE FORMS AND ATTACHMENTS

Sample Forms

Affirmative Action Program Requirement – Subcontractor(s).....Forms Page 1
Contractor’s Report Of Employment And Weekly Affidavit.....Forms Page 2
Monthly Employment Utilization ReportForms Page 4
Shop Drawing Schedule.....Forms Page 5
Shop Drawing IDForms Page 6
Request For Approval Of EqualForms Page 7
Request For Approval Of Substitutions.....Forms Page 8
Contractor’s Ultra Low Sulfur Diesel Fuel Affidavit.....Forms Page 9
Contractor’s Ultra Low Sulfur Diesel Fuel-LOGForms Page 10
Electronic Funds Transfer (EFT)-Vendor Direct Payment Authorization Form.....Forms Page 11

Sample Contract And Bond

Sample Contract And Bond For Construction A-1

Schedule Of Hourly Rates And Supplements

Schedule Of Hourly Rates And Supplements.....B-1

TABLE OF CONTENTS

DIVISION 1 – GENERAL CONDITIONS

01 00 00	Special Requirements
01 20 00	Price and Payment Procedures
01 30 00	Administrative Requirements
01 32 16	Construction Progress Schedule
01 32 33	Pre-Construction Building Survey
01 35 26	Health and Safety Requirements
01 45 00	Quality Control
01 50 00	Temporary Facilities and Controls
01 52 14	Engineer's Field Office
01 52 15	Contractor's Field Facilities
01 65 00	Product Delivery, Storage, and Handling
01 70 00	Execution and Closeout
01 74 19	Construction Waste Management and Disposal
01 78 23	Operations and Maintenance Data
01 78 36	Warranties
01 78 39	Project Record Documents

DIVISION 2 – EXISTING CONDITIONS

02 01 00	Maintenance of Existing Conditions
02 41 16	Structure Demolition
02 41 19	Selective Demolition
02 82 00	Asbestos Removal
02 83 33.13	Removal and Disposal of Lead-Containing Paint

DIVISION 3 - CONCRETE

03 05 51	Concrete Bonding Agents
03 05 55	Concrete Admixtures and Additives
03 11 13	Structural Cast-in-Place Concrete Forming
03 15 00	Concrete Accessories
03 30 00	Concrete and Reinforcing Steel
03 39 00	Concrete Curing
03 49 00	Glass Fiber Reinforced Concrete (GFRC)
03 60 00	Grout

DIVISION 5 - METAL

05 12 00	Structural Steel Framing
05 31 00	Steel Deck
05 40 00	Cold Formed Metal Framing
05 50 00	Metal Fabrications and Anchorage

CONTRACT No. 22-523
TECHNICAL SPECIFICATIONS – TABLE OF CONTENTS

DIVISION 6 – WOOD, PLASTICS, AND COMPOSITES

06 10 00	Rough Carpentry
06 10 53	Wood Nailers and Blocking
06 13 23	Heavy Timber Construction
06 18 00	Timber Construction
06 21 00	Glued Laminated Construction
06 40 13	Exterior Architectural Woodwork
06 64 00	Fiberglass Reinforced Plastic Panels

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

07 01 50.22	Preparation for Reroofing
07 21 00	Thermal Insulation
07 31 13	Asphalt Shingles
07 46 23	Wood Siding Assemblies
07 52 16	SBS Modified Bituminous Membrane Roofing
07 62 00	Sheet Metal Flashing
07 71 00	Roof Specialties and Accessories
07 84 13	Penetration Firestopping
07 84 43	Joint Firestopping
07 92 00	Joint Sealants

DIVISION 8 - OPENINGS

08 11 13	Hollow Metal Doors and Frames
08 14 33	Stile and Rail Wood Doors
08 31 13	Access Doors and Frames
08 33 00	Overhead Bi-Fold Doors
08 33 13	Coiling Counter Doors (Non-Fire Rated & Fire Rated)
08 33 23	Overhead Coiling Doors (Non-Fire Rated & Fire Rated)
08 51 13	Aluminum Windows
08 54 13	Fiberglass Windows
08 62 10	Steel Sash Window Restoration
08 71 00	Door Hardware
08 80 00	Glass and Glazing

DIVISION 9 - FINISHES

09 24 00	Cement Plastering
09 29 00	Gypsum Drywall
09 30 13	Ceramic Tiling
09 67 23	Resinous Flooring
09 91 00	Painting and Finishing

CONTRACT No. 22-523
TECHNICAL SPECIFICATIONS – TABLE OF CONTENTS

DIVISION 10 - SPECIALTIES

10 14 23.16	Room-Identification Panel Signage
10 28 00	Toilet Accessories
10 44 16	Fire Extinguishers
10 60 00	Polycarbonate Roofing Glazing System
10 75 00	Flagpoles
10 81 13	Bird Control Netting

DIVISION 12 – FURNISHINGS AND ACCESSORIES⁵⁷

12 11 00	Mural Art
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DIVISION 21 – FIRE SUPPRESSION

21 05 17	Sleeves And Sleeve Seals for Fire Suppression Piping
21 05 18	Escutcheons For Fire Suppression Piping
21 05 23	General Duty Valves for Water Based Fire Suppression Piping
21 05 29	Hangers And Supports for Fire Suppression Piping and Equipment
21 05 48	Vibration And Seismic Control for Fire Suppression Piping and Equipment
21 05 53	Identification For Fire Suppression Piping and Equipment
21 11 00	Facility Fire-Suppression Water-Service Piping
21 11 19	Fire Department Connections
21 13 13	Wet-Pipe Sprinkler Systems
21 13 16	Dry-Pipe Sprinkler Systems

DIVISION 22 – PLUMBING

22 05 17	Sleeves and Sleeve Seals for Plumbing Piping
22 05 18	Escutcheons for Plumbing Piping
22 05 23.12	Ball Valves for Plumbing Piping
22 05 23.15	Gate Valves for Plumbing Piping
22 05 29	Hangers and Supports for Plumbing Piping and Equipment
22 05 53	Identification for Plumbing Piping and Equipment
22 07 19	Plumbing Piping Insulation
22 11 13	Facility Water Distribution Piping
22 11 16	Domestic Water Piping
22 11 19	Domestic Water Piping Specialties
22 13 13	Facility Sanitary Sewers
22 13 16	Sanitary Waste and Vent Piping
22 13 19	Sanitary Waste Piping Specialties
22 13 19.13	Sanitary Drains
22 13 29	Sanitary Sewerage Pumps
22 15 13	General-Service Compressed-Air Piping
22 15 19	General-Service Packaged Air Compressors and Receivers
22 33 00	Electric, Domestic-Water-Heaters

CONTRACT No. 22-523
TECHNICAL SPECIFICATIONS – TABLE OF CONTENTS

22 42 13.13	Commercial Water Closets
22 42 16.13	Commercial Lavatories
22 42 16.16	Commercial Sinks

DIVISION 23 – MECHANICAL

23 05 00	Common Work Results for HVAC
23 05 13	Common Motor Requirements for HVAC Equipment
23 05 17	Sleeves and Sleeve Seals for HVAC Piping
23 05 29	Hangers and Supports for HVAC Piping and Equipment
23 05 48	Vibration and Seismic Controls for HVAC
23 05 53	Identification for HVAC Piping and Equipment
23 05 93	Testing, Adjusting, and Balancing for HVAC
23 07 00	HVAC Insulation
23 09 00	Instrumentation and Control for HVAC
23 23 00	Refrigerant Piping
23 31 13	Metal Ducts
23 33 00	Air Duct Accessories
23 34 00	HVAC Fans
23 34 10	HVAC Ceiling Fans
23 37 00	Air Outlets and Inlets
23 74 00	Packaged Outdoor Rooftop Air Handling Units
23 82 00	Terminal Heating and Cooling Units

DIVISION 26 - ELECTRICAL

26 01 26	Testing
26 05 01	Electrical General Provision
26 05 05	Demolition Electrical
26 05 19	Wires and Cables (600V Maximum)
26 05 21	Labeling and Identification
26 05 26	Grounding System
26 05 29	Hangers and Supports
26 05 33	Electrical Raceway Systems
26 18 13	Fuses
26 22 13	Low Voltage Distribution Transformers
26 24 16	Panelboards
26 27 26	Wiring Devices
26 28 23	Low Voltage Electric Control Equipment and Devices
26 30 00	Electric Motors
26 41 13	Lightning Protection for Structures
26 51 00	Lighting System

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

28 46 21.11	Addressable Fire-Alarm Systems
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CONTRACT No. 22-523
TECHNICAL SPECIFICATIONS – TABLE OF CONTENTS

DIVISION 31 - EARTHWORK

31 00 00	Earthwork
31 10 00	Site Clearing
31 19 13	Geotechnical Instrumentation and Monitoring
31 22 13	Rough Grading
31 23 16	Excavation
31 23 19	Dewatering
31 23 23.13	Backfill
31 23 24	Compaction
31 23 33	Trenching
31 41 00	Excavation Protection System
31 62 15	Drilled Micropiles (with App A - Historical Boring Information)

DIVISION 32 – EXTERIOR IMPROVEMENTS

32 12 16	Asphalt Paving
32 33 00	Site Furnishings

DIVISION 33 – UTILITIES

33 41 00	Storm Utility Drainage Piping
33 44 13.13	Precast Concrete Catch Basins and Field Inlets
33 44 16	Trench Drain
33 49 13.13	Storm Drainage and Sewer Manholes
33 71 19	Electrical Underground Ducts and Manholes



1. **GENERAL REQUIREMENTS AND PROPOSALS**

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

Division of Engineering

GENERAL REQUIREMENTS

1. DESCRIPTION OF THE WORK

Work under this Contract includes all necessary labor, materials and equipment required for:

The restoration of the Historic Dragon Coaster Station, the Park's two Historic Arcade Buildings along with the West Cross-Axis Games and Food structures. Work includes all associated mechanical, plumbing and electrical work

It is not intended that this description of work mention each particular item required, but that it give information concerning the general scope and areas of work for the convenience of the bidders.

THIS PROJECT IS NOT SUBJECT TO THE REQUIREMENTS OF THE “WICKS LAW”. ACCORDINGLY, EACH BIDDER IS REQUIRED TO SUBMIT SPECIFIC INFORMATION PERTAINING TO ITS PROPOSED SUBCONTRACTORS. PLEASE SEE THE “NOTICE TO CONTRACTORS” THAT FORMS A PART OF THESE BID DOCUMENTS.

GENERAL REQUIREMENTS

2. SUBCONTRACTING & DIRECT EMPLOYMENT OF LABOR

The Contractor shall not subcontract more than ninety (90%) percent of its bid. The Contractor must directly employ at least ten (10%) percent of the personnel working on this contract as measured in man-days worked.

“Directly employ” shall be construed to include only workers employed and paid directly by the Contractor, usually for wages or salary.

The Contractor expressly acknowledges that any violation of this provision constitutes a default under this contract.

3. REQUIRED TIME FOR COMPLETION OF THE WORK

Notification to commence the work will require the mandatory submission of all the executed contracts and the Certificates of Insurance after receipt of authority to award.

The Contractor shall commence the work embraced in this contract within ten (10) days of the service of Notice by the County to do so and shall complete the said work by no later than May 17, 2024.

GENERAL REQUIREMENTS

4. SECURITY REGULATIONS

Security Regulations For all County Facilities except County Correctional Facilities:

- A. Contractor's attention is called to the fact that this work is to be performed on property which is the responsibility of the County; therefore, all personnel associated with this contract are subject to special conditions affecting security and control of the facilities operations. Every person required to enter the work site will be issued an ID card and be required to fill out appropriate applications. **There is a \$30.00 processing fee for each lost ID card**; remitted by check made payable to the County of Westchester. All ID processing will be scheduled by the Construction Administrator.
- B. The Contractor/Subcontractor shall issue a copy of the security regulations (Paragraph C) to all personnel engaged on this project.
- C. All Contractor/Subcontractor personnel shall be bound by the following security regulations for the duration of this contract.
 - 1) All personnel must conspicuously display the ID card and identify themselves upon request.
 - 2) If an ID card is misplaced or lost, report this immediately to the Inspector.
 - 3) All Contractor/Subcontractor personnel are responsible for all tools and equipment and you must report any loss immediately to the Construction Administrator.
 - 4) All personnel must observe all orders of the Owner.
 - 5) All personnel are to report any unusual incidents or problems to the Construction Administrator immediately.
 - 6) All personnel shall not possess or consume any alcoholic beverage or illegal drug or medication while on the property, or report to work under the influence of alcohol or drugs.
 - 7) Any vehicle left on the property must be locked and the ignition keys must be removed. Vehicles will not be left overnight without prior approval.
 - 8) All personnel shall not enter any other areas of the premises (except the areas agreed to) without prior approval of the Construction Administrator.

Security Regulations For County Correctional Facilities:

- A. Contractor's attention is called to the fact that this work is to be performed on property adjacent and/or within the County's Correctional Facilities; therefore, all personnel associated with this project are subject to special conditions affecting security and control of the Correctional Facility Operations. Every person required to enter the work site will be fingerprinted, processed for a photo ID card and be required to fill out appropriate applications. **There is a \$100.00 processing fee for each person**, checks made payable to the Commissioner of Finance. All ID processing will be scheduled by the Construction Administrator.

GENERAL REQUIREMENTS

- B. All Contractors and Subcontractors shall issue a copy of the security regulations (Paragraph C) to all personnel to be engaged on this project.
- C. All Contractor's and Subcontractor's personnel shall be bound by the following security regulations for the duration of this project.
 - 1) All personnel entering the Penitentiary, Jail or Women's Unit must stop and identify themselves to the Control or Desk Officer who will issue the appropriate pass after ascertaining that they have been cleared to enter the facility. Only workers with valid ID will be permitted entry. **NO HELPERS.**
 - 2) All personnel must sign in the Visitor's Book, to include the following information: **PERSON'S NAME, COMPANY NAME, REASON FOR ENTRY, WORK LOCATION IN BUILDING.**
 - 3) All personnel must conspicuously display the ID card and identify themselves upon request.
 - 4) If ID card is misplaced or lost, report this loss immediately to the Shift Captain or Associate Warden.
 - 5) All tradesmen will be required to perform a tool inventory inspection of all tools in their possession to demonstrate to the admitting Correction Officer that the typed inventory list matches the tools each time they enter and leave the building. The tradesmen are responsible for keeping all tools and equipment locked when not in immediate use and they must report any loss of tools or equipment immediately to the Shift Captain or Associate Warden.
 - 6) All tradesmen and helpers shall carry all tools in a locked and secured tool box or tool cart. A typed inventory sheet shall be carried with the tool box/cart listing all hand and power tools. A manufacturer's MSD Sheet shall be carried with the tool box/cart for any chemical compound that the tradesman has in his/her possession.
 - 7) All debris (i.e. packaging, demolition, etc) shall be removed from the worksite at the end of each workday.
 - 8) All personnel are subject to search at all times.
 - 9) All personnel must observe all orders of Correctional Staff.
 - 10) All personnel are to report any unusual incidents or problems to a Correction Officer, Shift Captain or the Associate Warden immediately.
 - 11) All personnel shall not possess or consume any alcoholic beverage or illegal drug or medication while on County property, or report to work under the influence of alcohol or drugs.
 - 12) Any vehicle left on County property must be locked and the ignition keys must be removed. Vehicles will not be left over-night on County property without prior approval.
 - 13) All personnel shall not enter any other areas of the prison (except the areas agreed to) without prior approval of the Shift Captain or the Associate Warden.

GENERAL REQUIREMENTS

- 14) All personnel shall not bring anything in for any inmate/detainee or staff member or take out anything for any inmate/detainee or staff member.
- 15) All personnel shall not engage in any unnecessary conversations with any inmate/detainee.
- 16) Weapons, i.e., guns, knives, blackjacks, to include any tool activated by gunpowder or other explosive charge is prohibited in the building (i.e., stud gun). Violators of this rule are subject to arrest.
- 17) All personnel must sign out when leaving and must return the ID card to the Control/Desk Officer before leaving.
- 18) Failure of the contractor to follow these procedures will result in the contractor being denied access to the facility.

5. PAYMENT FOR BONDS AND INSURANCE

The amount bid for contract bonds and insurance shall not exceed 3% of the total contract price excluding the bid price for Miscellaneous Additional Work (Item W800) and Field Testing Equipment (W851), where applicable. Should the bidder exceed the foregoing three percent (3%), the Department will make the necessary adjustment to determine the total amount bid based on the arithmetically correct proposal.

The amount bid shall be payable with the first contract payment.

GENERAL REQUIREMENTS

6. ITEM W851 - TESTING OF MATERIALS AND FIELD TESTING EQUIPMENT

DESCRIPTION:

Under this item the Contractor shall include in their bid the sum printed in the Proposal opposite this item for testing and inspection fees and costs and for the purchase of field testing equipment.

Contract items shall be tested and inspected as per the item specification in such amounts as directed by the Engineer. The laboratories and arrangements for this testing shall be made by the Engineer only.

Field testing equipment, as needed, shall be purchased for the Engineer's use according to his direction. The equipment shall remain the property of the County.

The Contractor shall submit all bills and vouchers for testing and inspection services and costs and testing equipment to the Engineer for audit and approval before payment. After payment, a receipted copy of each bill or voucher shall be returned to the Engineer. All bills shall be paid within 30 days after their approval by the Engineer.

Bills not paid within 30 days will be paid by the County and the amounts of such payments shall be deducted from the Contractor's estimates together with a collection charge of 3% of the amounts so paid by the County.

METHOD OF MEASUREMENT:

The dollar-cents amount set forth in the proposal is a fixed price for all bidders and shall not be changed. If the amount is altered, the new figure will be disregarded and the original amount used to determine the total amount bid for the contract.

PAYMENT:

The amount paid the Contractor under this item shall be the actual total amount of the bills and vouchers approved by the Engineer for testing and inspection of materials and purchase of field testing equipment and an additional five percent (5%) for administrative costs.

The amount printed on the Proposal appears for purpose of canvas. Any bid other than the specified amount will be considered informal. The actual amount spent may be more or less than the amount stipulated in the Proposal.

GENERAL REQUIREMENTS

7. ADDITIONAL INSURANCE REQUIREMENTS

1. The successful bidder shall submit with their bid, copies of the Insurance Policies in the types and amounts as stipulated above in the Information for Bidders Section "Insurance Requirements". In addition to the "claims made" insurance policies, the contractor shall maintain an Asbestos and Lead Abatement General Liability Occurrence Policy, in amounts not less than \$1,000,000 and naming owner as the certificate holder.

"The County of Westchester" must be included as an Additional Named Insured under all insurance policies associated with this project.

2. The hauler carrying asbestos and lead to the disposal site in addition to the types and amounts stipulated in the Information of Bidders section "Insurance Requirements", shall carry Pollution Liability Insurance covering Transit, Sudden & Accidental, and Clean-up in the amount not less than \$1,000,000.
Endorsements to existing policy will be acceptable

CONTRACT DRAWINGS:

CONTRACT NUMBER 22-523

The Design Drawings, as listed on the Contract Drawing Index, herewith made a part of these Specifications, shows in general and/or in detail the work to be done under this Contract and/or the various Contracts forming the entire work for the Project, as described herein.

After sending the executed contract to the County and prior to the first job meeting, the Contractor is responsible for obtaining from Public Works, Division of Engineering, Michaelian Office Building, White Plains, a maximum of five gratis copies of the Contract Drawings and Specifications; for the Contractor's permanent possession. Additional sets, requested by the Contractor, beyond the permitted number and time limit, will be furnished by Public Works; but at the Contractor's expense.

<u>DRAWING #</u>	<u>SHEET NAME</u>	<u>SHEET #</u>
1-118-T-751-0	COVER SHEET	T-01
1-118-G-752-0	DRAWING LIST	T-02
1-118-G-753-0	ACCESSIBILITY DETAILS, GENERAL SYMBOLS AND ABBREVIATIONS	T-03
1-118-G-754-0	SITE PLAN & SCOPE OF WORK	T-04
1-118-G-755-0	FEMA MAPS	T-05
1-118-G-756-0	CONTRACTOR INFORMATION- CAPITAL CONTRACTS, SITE ACTIVITIES, AND SITE CONDITIONS	T-06
1-118-G-757-0	CONTRACTOR INFORMATION- SITE PLAN DETAIL	T-07
1-118-G-758-0	FIRESTOPPING DETAILS 1 OF 2	T-08
1-118-G-759-0	FIRESTOPPING DETAILS 2 OF 2	T-09
<u>GENERAL (ELECTRICAL)</u>		
1-118-G-760-0	ELECTRICAL SYMBOLS, ABBREVIATIONS AND NOTES	GE-E-01
1-118-G-761-0	SITE PLAN	GE-E-02
1-118-G-762-0	LIGHTING FIXTURE SCHEDULE	GE-E-03
<u>BURGER BARN</u>		
<u>GENERAL</u>		
1-118-G-763-0	BUILDING INTRO	BB-G-01
1-118-G-764-0	EGRESS PLANS AND CODE ANALYSIS	BB-G-02
1-118-G-765-0	SITE RESTORATION PLAN	BB-G-03
<u>ENVIRONMENTAL</u>		
1-118-G-766-0	GENERAL ASBESTOS ABATEMENT NOTES	BB-H-10
1-118-G-767-0	ROOF- ASBESTOS ABATEMENT PLAN	BB-H-11
1-118-G-768-0	GENERAL LEAD REMEDIATION NOTES	BB-H-20
1-118-G-769-0	NW, SW & SE ELEVATIONS- LEAD REMEDIATION PLAN	BB-H-21
1-118-G-770-0	NE & SE ELEVATIONS- LEAD REMEDIATION PLAN	BB-H-22

ARCHITECTURAL

1-118-A-771-0	GROUND FLOOR DEMOLITION PLAN	BB-A-01
1-118-A-772-0	GROUND FLOOR DEMOLITION- REFLECTED CEILING PLANS	BB-A-02
1-118-A-773-0	ROOF DEMOLITION PLAN	BB-A-03
1-118-A-774-0	EXTERIOR DEMOLITION ELEVATIONS 1	BB-A-04
1-118-A-775-0	EXTERIOR DEMOLITION ELEVATIONS 2	BB-A-05
1-118-A-776-0	CONSTRUCTION PLANS	BB-A-11
1-118-A-777-0	REFLECTED CEILING PLAN	BB-A-12
1-118-A-778-0	ROOF CONSTRUCTION PLAN	BB-A-13
1-118-A-779-0	FINISH PLAN	BB-A-14
1-118-A-780-0	EXTERIOR ELEVATION 1	BB-A-21
1-118-A-781-0	EXTERIOR ELEVATION 2	BB-A-22
1-118-A-782-0	BUILDING SECTIONS 1	BB-A-31
1-118-A-783-0	INTERIOR ELEVATIONS	BB-A-51
1-118-A-784-0	KITCHEN INTERIOR ELEVATIONS	BB-A-52
1-118-A-785-0	BUILDING TOWER DETAILS	BB-A-81
1-118-A-786-0	CEILING DETAILS	BB-A-82
1-118-A-787-0	ROOF DETAILS	BB-A-83
1-118-A-788-0	BIFOLD DOOR DETAILS	BB-A-84
1-118-A-789-0	COLUMN DETAILS	BB-A-85
1-118-A-790-0	ENLARGED BATHROOM PLANS	BB-A-86
1-118-A-791-0	FLOORING DETAILS	BB-A-87
1-118-A-792-0	SIGNAGE DETAILS	BB-A-88
1-118-A-793-0	FENCE DETAILS	BB-A-89
1-118-A-794-0	DOOR & HARDWARE SCHEDULE	BB-A-91
1-118-A-795-0	WINDOW SCHEDULE AND DETAILS	BB-A-92
1-118-A-796-0	PARTITION TYPES & WALL DETAILS	BB-A-93

STRUCTURAL

1-118-S-797-0	STRUCTURAL NOTES	BB-S-01
1-118-S-798-0	STRUCTURAL ABBREVIATIONS & SYMBOLS	BB-S-02
1-118-S-799-0	DEMOLITION - GROUND FLOOR PLAN	BB-S-03
1-118-S-800-0	DEMOLITION - ROOF PLAN	BB-S-04
1-118-S-801-0	FOUNDATION PLAN	BB-S-05
1-118-S-802-0	GROUND FLOOR PLAN	BB-S-06
1-118-S-803-0	ROOF PLAN	BB-S-07
1-118-S-804-0	SECTIONS AND DETAILS	BB-S-08
1-118-S-805-0	SECTIONS	BB-S-09
1-118-S-806-0	SECTIONS AND DETAILS	BB-S-10
1-118-S-807-0	SECTIONS AND DETAILS	BB-S-11
1-118-S-808-0	SECTIONS AND DETAILS	BB-S-12
1-118-S-809-0	SECTIONS AND DETAILS	BB-S-13
1-118-S-810-0	TYPICAL SECTIONS AND DETAILS	BB-S-14

FIRE PROTECTION

1-118-FP-811-0	FIRE PROTECTION NOTES, SYMBOLS, ABBREV'S & DWG LIST	BB-FP-01
1-118-FP-812-0	FIRE PROTECTION GROUND FL DEMOLITION PLAN	BB-FP-11
1-118-FP-813-0	FIRE PROTECTION GROUND FL CONSTRUCTION PLAN & RCP	BB-FP-21
1-118-FP-814-0	FIRE PROTECTION DETAILS	BB-FP-81

PLUMBING

1-118-P-815-0	PLUMBING NOTES, SYMBOLS, ABBREV'S & DWG LIST	BB-P-01
1-118-P-816-0	PLUMBING GROUND FLOOR CONSTRUCTION PLAN	BB-P-21
1-118-P-817-0	PLUMBING DETAILS	BB-P-81

MECHANICAL

1-118-M-818-0	MECHANICAL NOTES, SYMBOLS & LEGENDS	BB-M-01
1-118-M-819-0	MECHANICAL FIRST FLOOR DEMOLITION PLAN	BB-M-11
1-118-M-820-0	MECHANICAL FIRST FLOOR CONSTRUCTION PLAN	BB-M-21
1-118-M-821-0	MECHANICAL ROOF CONSTRUCTION PLAN	BB-M-22
1-118-M-822-0	MECHANICAL EXTERIOR BUILDING ELEVATIONS	BB-M-23
1-118-M-823-0	MECHANICAL SCHEDULES	BB-M-61
1-118-M-824-0	MECHANICAL DETAILS 1 OF 2	BB-M-81
1-118-M-825-0	MECHANICAL DETAILS 2 OF 2	BB-M-82
1-118-M-826-0	MECHANICAL CONTROLS	BB-M-91

ELECTRICAL

1-118-E-827-0	ONE LINE DIAGRAM & PANEL SCHEDULES - DEMOLITION	BB-E-01
1-118-E-828-0	GROUND FLOOR - DEMOLITION PLAN	BB-E-02
1-118-E-829-0	ROOF DEMOLITION PLAN	BB-E-03
1-118-E-830-0	SITE DUCTBANK PLAN	BB-E-04
1-118-E-831-0	ONE LINE DIAGRAMS	BB-E-05
1-118-E-832-0	GROUND FLOOR - POWER PLAN	BB-E-06
1-118-E-833-0	GROUND FLOOR - LIGHTING PLAN	BB-E-07
1-118-E-834-0	ROOF PLAN - POWER & LIGHTNING PROTECTION	BB-E-08
1-118-E-835-0	PANEL SCHEDULES	BB-E-09

FIRE ALARM

1-118-FA-836-0	FIRE ALARM NOTES, SYMBOLS, AND LEGEND	BB-FA-01
1-118-FA-837-0	FIRE ALARM FIRST FLOOR DEMOLITION PLAN	BB-FA-11
1-118-FA-838-0	FIRE ALARM FIRST FLOOR CONSTRUCTION PLAN	BB-FA-21
1-118-FA-839-0	FIRE ALARM ROOF CONSTRUCTION PLAN	BB-FA-22
1-118-FA-840-0	FIRE ALARM RISER DIAGRAM AND DETAILS	BB-FA-81

CIVIL

1-118-C-841-0	GENERAL NOTES	BB-C-01
1-118-C-842-0	EXISTING CONDITIONS/ DEMOLITION PLAN	BB-C-02
1-118-C-843-0	SITE CONSTRUCTION PLAN	BB-C-03
1-118-C-844-0	UTILITY CONSTRUCTION PLAN	BB-C-04
1-118-C-845-0	GRADING AND EROSION CONTROL PLAN	BB-C-05
1-118-C-846-0	CIVIL DETAILS 1	BB-C-06
1-118-C-847-0	CIVIL DETAILS 2	BB-C-07

CXA BUILDING

GENERAL

1-118-G-848-0	BUILDING INTRO	CXA-G-01
1-118-G-849-0	CXA- LIFE SAFETY PLANS	CXA-G-02
1-118-G-850-0	CXA- FIRE SEPARATION PLAN	CXA-G-02.1
1-118-G-851-0	CXA- SITE RESTORATION	CXA-G-03

ENVIRONMENTAL

1-118-G-852-0	GENERAL ASBESTOS ABATEMENT NOTES	CXA-H-10
1-118-G-853-0	GROUND FLOOR- ASBESTOS ABATEMENT PLAN	CXA-H-11
1-118-G-854-0	GENERAL LEAD REMEDIATION NOTES	CXA-H-20
1-118-G-855-0	EAST AND WEST ELEVATION- LEAD REMEDIATION PLAN	CXA-H-21
1-118-G-856-0	NORTH AND SOUTH ELEVATION- LEAD REMEDIATION PLAN	CXA-H-81

ARCHITECTURAL

1-118-A-857-0	CXA- GROUND FLOOR DEMOLITION PLAN	CXA-A-01
1-118-A-858-0	CXA- ROOF FLOOR DEMOLITION PLAN	CXA-A-02
1-118-A-859-0	CXA- DEMOLITION ELEVATIONS	CXA-A-03
1-118-A-860-0	CXA- DEMOLITION ELEVATIONS	CXA-A-04
1-118-A-861-0	CXA- DEMOLITION REFLECTED CEILING PLAN	CXA-A-05
1-118-A-862-0	CXA- GROUND FLOOR PLAN	CXA-A-11
1-118-A-863-0	CXA- ATTIC LEVEL PLAN	CXA-A-12
1-118-A-864-0	CXA- ROOF PLAN	CXA-A-13
1-118-A-865-0	CXA- EXTERIOR BUILDING ELEVATIONS	CXA-A-21
1-118-A-866-0	CXA- EXTERIOR BUILDING ELEVATIONS	CXA-A-22
1-118-A-867-0	CXA- PORCH BUILDING ELEVATIONS	CXA-A-23
1-118-A-868-0	CXA- DRIVE-THROUGH ELEVATIONS	CXA-A-24
1-118-A-869-0	CXA- BUILDING SECTIONS	CXA-A-31
1-118-A-870-0	CXA- BUILDING SECTIONS	CXA-A-32
1-118-A-871-0	CXA- ENLARGED SECTIONS	CXA-A-33
1-118-A-872-0	CXA- WALL ENLARGED SECTIONS 2	CXA-A-34
1-118-A-873-0	CXA- GROUND LEVEL RCP	CXA-A-41
1-118-A-874-0	CXA- ATTIC LEVEL RCP	CXA-A-42
1-118-A-875-0	COLUMN DETAILS	CXA-A-80
1-118-A-876-0	COLUMN DETAILS 2	CXA-A-81
1-118-A-877-0	WOOD RESTORATION DETAILS	CXA-A-82
1-118-A-878-0	ROOFING DETAILS	CXA-A-83
1-118-A-879-0	PARTITION DETAILS	CXA-A-84
1-118-A-880-0	OVERHEAD DOOR DETAIL	CXA-A-85
1-118-A-881-0	DETAILS	CXA-A-86
1-118-A-882-0	FENCE AND GATE DETAILS	CXA-A-87
1-118-A-883-0	DRIVE THROUGH GATE DETAILS	CXA-A-88
1-118-A-884-0	FINISH PLAN AND FINISH SCHEDULE	CXA-A-91
1-118-A-885-0	DOOR & HARDWARE SCHEDULES & DETAILS	CXA-A-92
1-118-A-886-0	WINDOW SCHEDULE	CXA-A-93
1-118-A-887-0	SIGNAGE TYPES AND DETAILS	CXA-A-94

STRUCTURAL

1-118-S-888-0	STRUCTURAL NOTES	CXA-S-01
1-118-S-889-0	STRUCTURAL ABBREVIATIONS AND SYMBOLS	CXA-S-02
1-118-S-890-0	DEMOLITION - GROUND FLOOR PLAN	CXA-S-03
1-118-S-891-0	DEMOLITION - ROOF PLAN	CXA-S-04
1-118-S-892-0	FOUNDATION PLAN	CXA-S-05
1-118-S-893-0	GROUND FLOOR PLAN	CXA-S-06
1-118-S-894-0	ROOF PLAN	CXA-S-07
1-118-S-895-0	SECTION	CXA-S-08
1-118-S-896-0	SECTIONS	CXA-S-09
1-118-S-897-0	SECTIONS AND DETAILS	CXA-S-10
1-118-S-898-0	SECTIONS	CXA-S-11
1-118-S-899-0	SECTIONS	CXA-S-12

FIRE PROTECTION

1-118-FP-900-0	FIRE PROTECTION NOTES, SYMBOLS, ABBREVIATIONS & DWG LIST	CXA-FP-01
1-118-FP-901-0	FIRE PROTECTION FIRST FLOOR DEMOLITION RCP	CXA-FP-11
1-118-FP-902-0	FIRE PROTECTION FIRST FLOOR AND ATTIC CONSTRUCTION RCP	CXA-FP-21
1-118-FP-903-0	FIRE PROTECTION DETAILS	CXA-FP-81

PLUMBING

1-118-P-904-0	PLUMBING NOTES, SYMBOLS, ABBREVIATIONS AND DRAWING LIST	CXA-P-01
1-118-P-905-0	PLUMBING FIRST FLOOR CONSTRUCTION PLAN	CXA-P-21
1-118-P-906-0	PLUMBING DETAILS	CXA-P-81

MECHANICAL

1-118-M-907-0	MECHANICAL NOTES, SYMBOLS AND LEGENDS	CXA-M-01
1-118-M-908-0	MECHANICAL FIRST FLOOR DEMOLITION PLAN	CXA-M-11
1-118-M-909-0	MECHANICAL FIRST FLOOR CONSTRUCTION PLAN	CXA-M-21
1-118-M-910-0	MECHANICAL SCHEDULES	CXA-M-61
1-118-M-911-0	MECHANICAL DETAILS	CXA-M-81
1-118-M-912-0	MECHANICAL CONTROLS	CXA-M-91

ELECTRICAL

1-118-E-913-0	ONE LINE DIAGRAM- DEMOLITION	CXA-E-01
1-118-E-914-0	GROUND FLOOR DEMOLITION PLAN	CXA-E-02
1-118-E-915-0	SITE DUCTBANK PLAN	CXA-E-03
1-118-E-916-0	ONE LINE DIAGRAMS	CXA-E-04
1-118-E-917-0	GROUND FLOOR - POWER PLAN	CXA-E-05
1-118-E-918-0	GROUND FLOOR - LIGHTING PLAN	CXA-E-06
1-118-E-919-0	ATTIC LEVEL - POWER & LIGHTING PLAN	CXA-E-07
1-118-E-920-0	ROOF - LIGHTING & LIGHTING PROTECTION PLAN	CXA-E-08
1-118-E-921-0	PANEL SCHEDULES	CXA-E-09

FIRE ALARM

1-118-FA-922-0	FIRE ALARM NOTES, SYMBOLS, LEGEND, AND RISER DIAGRAM	CXA-FA-01
1-118-FA-923-0	FIRE ALARM FIRST FLOOR DEMOLITION PLAN	CXA-FA-11
1-118-FA-924-0	FIRE ALARM ATTIC DEMOLITION PLAN	CXA-FA-12
1-118-FA-925-0	FIRE ALARM FIRST FLOOR PLAN	CXA-FA-21
1-118-FA-926-0	FIRE ALARM ATTIC PLAN	CXA-FA-22
1-118-FA-927-0	FIRE ALARM DETAILS	CXF-FA-81

CIVIL

1-118-C-928-0	GENERAL NOTES	CXA-C-01
1-118-C-929-0	EXISTING CONDITIONS/ DEMOLITION PLAN	CXA-C-02
1-118-C-930-0	SITE CONSTRUCTION PLAN	CXA-C-03
1-118-C-931-0	UTILITY CONSTRUCTION PLAN	CXA-C-04
1-118-C-932-0	GRADING AND EROSION CONTROL PLAN	CXA-C-05
1-118-C-933-0	CIVIL DETAILS 1	CXA-C-06
1-118-C-934-0	CIVIL DETAILS 2	CXA-C-07

CXD BUILDING

GENERAL

1-118-G-935-0	BUILDING INTRO	CXD-G-01
1-118-G-936-0	CXD- LIFE SAFTEY PLANS	CXD-G-02
1-118-G-937-0	CXD- SITE RESTORATION	CXD-G-03

ENVIRONMENTAL

1-118-G-938-0	GROUND FLOOR- ASBESTOS ABATEMENT PLAN	CXD-H-10
1-118-G-939-0	GROUND FLOOR- ASBESTOS ABATEMENT PLAN	CXD-H-11
1-118-G-940-0	GENERAL LEAD REMEDIATION NOTES	CXD-H-20
1-118-G-941-0	NORTH AND EAST ELEVATIONS- LEAD REMEDIATION PLAN	CXD-H-21
1-118-G-942-0	SOUTH AND WEST ELEVATIONS- LEAD REMEDIATION PLAN	CXD-H-22

ARCHITECTURAL

1-118-A-943-0	CXD- GROUND FLOOR DEMOLITION PLAN	CXD-A-01
1-118-A-944-0	CXD- ROOF DEMOLITION PLAN	CXD-A-02
1-118-A-945-0	CXD- EXTERIOR BUILDING ELEVATIONS	CXD-A-03
1-118-A-946-0	CXD- RCP DEMO PLAN	CXD-A-04
1-118-A-947-0	CXD- GROUND FLOOR PLAN	CXD-A-11
1-118-A-948-0	CXD- ROOF PLAN	CXD-A-12
1-118-A-949-0	CXD- EXTERIOR BUILDING ELEVATIONS	CXD-A-21
1-118-A-950-0	CXD- EXTERIOR BUILDING PORCH ELEVATIONS	CXD-A-22
1-118-A-951-0	CXD- BUILDING SECTIONS	CXD-A-31
1-118-A-952-0	CXD- ENLARGED SECTION	CXD-A-32
1-118-A-953-0	CXD- GROUND FLOOR REFLECTED CEILING PLAN	CXD-A-41
1-118-A-954-0	COURTYARD PLAN AND SECTIONS	CXD-A-51
1-118-A-955-0	PARTITION TYPE DETAILS	CXD-A-80
1-118-A-956-0	ROOF DETAILS	CXD-A-81
1-118-A-957-0	CXD COLUMN DETAILS	CXD-A-82
1-118-A-958-0	ROLL UP DOOR DETAILS	CXD-A-83

1-118-A-959-0	FENCE AND GATE DETAILS	CXD-A-84
1-118-A-960-0	DETAILS	CXD-A-85
1-118-A-961-0	CDX FINISH PLAN AND FINISH SCHEDULE	CXD-A-91
1-118-A-962-0	DOOR SCHEDULE AND DOOR DETAILS	CXD-A-92
1-118-A-963-0	WINDOW SCHEDULE AND WINDOW DETAILS	CXD-A-93
1-118-A-964-0	SIGNAGE TYPES AND DETAILS	CXD-A-94
 <i><u>STRUCTURAL</u></i>		
1-118-S-965-0	STRUCTURAL NOTES	CXD-S-01
1-118-S-966-0	STRUCTURAL ABBREVIATIONS AND SYMBOLS	CXD-S-02
1-118-S-967-0	DEMOLITION- GROUND FLOOR PLAN	CXD-S-03
1-118-S-968-0	DEMOLITION- ROOF PLAN	CXD-S-04
1-118-S-969-0	GROUND FLOOR PLAN	CXD-S-05
1-118-S-970-0	SECTIONS	CXD-S-06
1-118-S-971-0	SECTIONS AND DETAILS	CXD-S-07
 <i><u>FIRE PROTECTION</u></i>		
1-118-FP-972-0	FIRE PROTECTION NOTES, SYMBOLS, ABBREV'S & DWG LIST	CXD-FP-01
1-118-FP-973-0	FIRE PROTECTION GROUND FL & ATTIC DEMOLITION PLANS	CXD-FP-11
1-118-FP-974-0	FIRE PROTECTION GROUND FL & ATTIC CONSTRUCTION RCP	CXD-FP-21
1-118-FP-975-0	FIRE PROTECTION DETAILS	CXD-FP-81
 <i><u>MECHANICAL</u></i>		
1-118-M-976-0	MECHANICAL NOTES, SYMBOLS AND LEGENDS	CXD-M-01
1-118-M-977-0	MECHANICAL FIRST FLOOR DEMOLITION	CXD-M-11
1-118-M-978-0	MECHANICAL FIRST FLOOR CONSTRUCTION PLAN	CXD-M-21
1-118-M-979-0	MECHANICAL SCHEDULE, DETAILS AND CONTROLS	CXD-M-61
 <i><u>ELECTRICAL</u></i>		
1-118-E-980-0	ONE LINE DIAGRAM- DEMOLITION	CXD-E-01
1-118-E-981-0	GROUND FLOOR DEMOLITION- POWER & LIGHTING PLAN	CXD-E-02
1-118-E-982-0	SITE DUCTBANK PLAN	CXD-E-03
1-118-E-983-0	ONE LINE DIAGRAM	CXD-E-04
1-118-E-984-0	GROUND FLOOR - POWER PLAN	CXD-E-05
1-118-E-985-0	GROUND FLOOR - LIGHTING PLAN	CXD-E-06
1-118-E-986-0	PANEL SCHEDULES	CXD-E-07
 <i><u>FIRE ALARM</u></i>		
1-118-FA-987-0	FIRE ALARM NOTES, SYMBOLS, LEGEND, & RISER DIAGRAM	CXD-FA-01
1-118-FA-988-0	FIRE ALARM FIRST FLOOR DEMOLITION PLAN	CXD-FA-11
1-118-FA-989-0	FIRE ALARM ATTIC DEMOLITION PLAN	CXD-FA-12
1-118-FA-990-0	FIRE ALARM FIRST FLOOR PLAN	CXD-FA-21
1-118-FA-991-0	FIRE ALARM ATTIC PLAN	CXD-FA-22
1-118-FA-992-0	FIRE ALARM DETAILS	CXD-FA-81

CIVIL

1-118-C-993-0	GENERAL NOTES	CXD-C-01
1-118-C-994-0	EXISTING CONDITIONS/ DEMOLITION PLAN	CXD-C-02
1-118-C-995-0	SITE CONSTRUCTION PLAN	CXD-C-03
1-118-C-996-0	UTILITY CONSTRUCTION PLAN	CXD-C-04
1-118-C-997-0	GRADING AND EROSION CONTROL PLAN	CXD-C-05
1-118-C-998-0	CIVIL DETAILS 1	CXD-C-06
1-118-C-999-0	CIVIL DETAILS 2	CXD-C-07

CXE BUILDING

GENERAL

1-118-G-1000-0	BUILDING INTRO	CXE-G-01
1-118-G-1001-0	CXE & CXF- LIFE SAFETY PLANS	CXE-G-02
1-118-G-1002-0	CXE- SITE RESTORATION	CXE-G-03

ENVIRONMENTAL

1-118-G-1003-0	GENERAL ASBESTOS ABATEMENT NOTES	CXE-H-10
1-118-G-1004-0	ROOF- ASBESTOS ABATEMENT PLAN	CXE-H-11
1-118-G-1005-0	GROUND FLOOR- ASBESTOS ABATEMENT PLAN	CXE-H-12
1-118-G-1006-0	GENERAL LEAD REMEDIATION NOTES	CXE-H-20
1-118-G-1007-0	NORTH & EAST ELEVATION- LEAD REMEDIATION PLAN	CXE-H-21
1-118-G-1008-0	SOUTH & WEST ELEVATION- LEAD REMEDIATION PLAN	CXE-H-22

ARCHITECTURAL

1-118-A-1009-0	CXE- GROUND FLOOR DEMOLITION PLAN	CXE-A-01
1-118-A-1010-0	CXE- ROOF DEMOLITION PLAN	CXE-A-02
1-118-A-1011-0	CXE- EXTERIOR DEMOLITION ELEVATIONS	CXE-A-03
1-118-A-1012-0	CXE- RCP DEMO PLAN	CXE-A-04
1-118-A-1013-0	CXE- GROUND FLOOR PLAN	CXE-A-11
1-118-A-1014-0	CXE- ATTIC PLAN	CXE-A-12
1-118-A-1015-0	CXE- ROOF PLAN	CXE-A-13
1-118-A-1016-0	CXE- EXTERIOR BUILDING ELEVATIONS	CXE-A-21
1-118-A-1017-0	CXE- EXTERIOR BUILDING PORCH ELEVATIONS	CXE-A-22
1-118-A-1018-0	CXE- BUILDING SECTIONS	CXE-A-31
1-118-A-1019-0	CXE- BUILDING SECTIONS	CXE-A-32
1-118-A-1020-0	CXE- GROUND FLOOR REFLECTED CEILING PLAN	CXE-A-41
1-118-A-1021-0	CXE- ATTIC REFLECTED CEILING PLAN	CXE-A-42
1-118-A-1022-0	PARTITION TYPES	CXE-A-80
1-118-A-1023-0	ROOF DETAILS	CXE-A-81
1-118-A-1024-0	CXE - COLUMN DETAILS	CXE-A-82
1-118-A-1025-0	CXE - COLUMN DETAILS 2	CXE-A-83
1-118-A-1026-0	ROLL UP DOOR DETAILS	CXE-A-84
1-118-A-1027-0	DETAILS	CXE-A-85
1-118-A-1028-0	FINISH PLAN AND FINISH SCHEDULE	CXE-A-91
1-118-A-1029-0	DOOR SCHEDULE AND DOOR DETAILS	CXE-A-92
1-118-A-1030-0	SIGNAGE TYPES AND DETAILS	CXE-A-93

STRUCTURAL

1-118-S-1031-0	STRUCTURAL NOTES	CXE-S-01
1-118-S-1032-0	STRUCTURAL ABBREVIATIONS AND SYMBOLS	CXE-S-02
1-118-S-1033-0	DEMOLITION - GROUND FLOOR PLAN	CXE-S-03
1-118-S-1034-0	DEMOLITION - ROOF PLAN	CXE-S-04
1-118-S-1035-0	GROUND FLOOR PLAN	CXE-S-05
1-118-S-1036-0	SECTIONS	CXE-S-06
1-118-S-1037-0	SECTIONS AND DETAILS	CXE-S-07

FIRE PROTECTION

1-118-FP-1038-0	FIRE PROTECTION NOTES, SYMBOLS, ABBREV'S & DWG LIST	CXE-FP-01
1-118-FP-1039-0	FIRE PROTECTION GROUND FL & ATTIC DEMOLITION PLAN	CXE-FP-11
1-118-FP-1040-0	FIRE PROTECTION GROUND FL & ATTIC CONSTRUCTION RCP	CXE-FP-21
1-118-FP-1041-0	FIRE PROTECTION DETAILS	CXE-FP-81

MECHANICAL

1-118-M-1042-0	MECHANICAL NOTES, SYMBOLS AND LEGENDS	CXE-M-01
1-118-M-1043-0	MECHANICAL FIRST FLOOR DEMOLITION PLAN	CXE-M-11

ELECTRICAL

1-118-E-1044-0	ONE LINE DIAGRAM- DEMOLITION	CXE-E-01
1-118-E-1045-0	GROUND FLOOR DEMOLITION- POWER AND LIGHTING PLAN	CXE-E-02
1-118-E-1046-0	SITE DUCTBANK PLAN	CXE-E-03
1-118-E-1047-0	ONE LINE DIAGRAMS	CXE-E-04
1-118-E-1048-0	GROUND FLOOR - POWER PLAN	CXE-E-05
1-118-E-1049-0	GROUND FLOOR- LIGHTING PLAN	CXE-E-06
1-118-E-1050-0	ATTIC LEVEL- LIGHTING PLAN	CXE-E-07
1-118-E-1051-0	ROOF LEVEL- LIGHTING & LIGHTNING PROTECTION PLAN	CXE-E-08
1-118-E-1052-0	PANEL SCHEDULES	CXE-E-09

FIRE ALARM

1-118-FA-1053-0	FIRE ALARM NOTES, SYMBOLS, LEGEND, AND RISER DIAGRAM	CXE-FA-01
1-118-FA-1054-0	FIRE ALARM FIRST FLOOR DEMOLITION PLAN	CXE-FA-11
1-118-FA-1055-0	FIRE ALARM ATTIC DEMOLITION PLAN	CXE-FA-12
1-118-FA-1056-0	FIRE ALARM FIRST FLOOR PLAN	CXE-FA-21
1-118-FA-1057-0	FIRE ALARM ATTIC PLAN	CXE-FA-22
1-118-FA-1058-0	FIRE ALARM DETAILS	CXE-FA-81

CIVIL

1-118-C-1059-0	GENERAL NOTES	CXE-C-01
1-118-C-1060-0	EXISTING CONDITIONS/ DEMOLITION PLAN	CXE-C-02
1-118-C-1061-0	SITE CONSTRUCTION PLAN	CXE-C-03
1-118-C-1062-0	UTILITY CONSTRUCTION PLAN	CXE-C-04
1-118-C-1063-0	GRADING AND EROSION CONTROL PLAN	CXE-C-05
1-118-C-1064-0	CIVIL DETAILS 1	CXE-C-06
1-118-C-1065-0	CIVIL DETAILS 2	CXE-C-07

CXF BUILDING

GENERAL

1-118-G-1066-0	BUILDING INTRO	CXF-G-01
1-118-G-1067-0	CXE & CXF - LIFE SAFETY PLANS	CXF-G-02
1-118-G-1068-0	CXE - SITE RESTORATION	CXF-G-03

ENVIRONMENTAL

1-118-G-1069-0	GENERAL ASBESTOS ABATEMENT NOTES	CXF-H-10
1-118-G-1070-0	ROOF ASBESTOS ABATEMENT PLAN	CXF-H-11
1-118-G-1071-0	GENERAL LEAD REMEDIATION NOTES	CXF-H-20
1-118-G-1072-0	NORTH, SOUTH & EAST LEAD REMEDIATION PLAN	CXF-H-21

ARCHITECTURAL

1-118-A-1073-0	CXF - GROUND FLOOR DEMOLITION PLAN	CXF-A-01
1-118-A-1074-0	CXF - ROOF DEMOLITION PLAN	CXF-A-02
1-118-A-1075-0	CXF - EXTERIOR DEMOLITION ELEVATIONS	CXF-A-03
1-118-A-1076-0	CXF - RCP DEMOLITION PLAN	CXF-A-04
1-118-A-1077-0	CXF - GROUND FLOOR PLAN	CXF-A-11
1-118-A-1078-0	CXF - ROOF PLAN	CXF-A-12
1-118-A-1079-0	CXF - EXTERIOR ELEVATIONS	CXF-A-21
1-118-A-1080-0	CXF - INTERIOR COLONNADE ELEVATIONS	CXF-A-22
1-118-A-1081-0	CXF - SECTIONS	CXF-A-31
1-118-A-1082-0	CXF - ENLARGED SECTION	CXF-A-32
1-118-A-1083-0	CXF - CANOPY SECTIONS	CXF-A-33
1-118-A-1084-0	CXF - COLONNADE SECTIONS	CXF-A-34
1-118-A-1085-0	CXF - GROUND FLOOR REFLECTED CEILING PLAN	CXF-A-41
1-118-A-1086-0	PARTITION TYPES AND DETAILS	CXF-A-80
1-118-A-1087-0	ROOF AND CEILING DETAILS	CXF-A-81
1-118-A-1088-0	CXF COLONNADE COLUMN DETAILS	CXF-A-82
1-118-A-1089-0	BALUSTRADE DETAILS	CXF-A-83
1-118-A-1090-0	BALUSTRADE DETAILS	CXF-A-84
1-118-A-1091-0	FENCE AND RAMP DETAIL	CXF-A-85
1-118-A-1092-0	COUNTER DOOR DETAILS	CXF-A-86
1-118-A-1093-0	BENCH AND MURAL DETAILS	CXF-A-87
1-118-A-1094-0	STEEL FENCE AND GATE DETAIL	CXF-A-88
1-118-A-1095-0	FINISH PLAN AND FINISH SCHEDULE	CXF-A-91
1-118-A-1096-0	DOOR SCHEDULE AND DOOR DETAILS	CXF-A-92
1-118-A-1097-0	WINDOW SCHEDULE AND WINDOW DETAILS	CXF-A-93
1-118-A-1098-0	SIGNAGE TYPES, SCHEDULES AND DETAILS	CXF-A-94

STRUCTURAL

1-118-S-1099-0	STRUCTURAL NOTES	CXF-S-01
1-118-S-1100-0	STRUCTURAL SYMBOLS & ABBREVIATIONS	CXF-S-02
1-118-S-1101-0	DEMOLITION- GROUND FLOOR PLAN	CXF-S-03
1-118-S-1102-0	DEMOLITION- SECTIONS & DETAILS	CXF-S-04
1-118-S-1103-0	FOUNDATION PLAN	CXF-S-05
1-118-S-1104-0	GROUND FLOOR PLAN	CXF-S-06

1-118-S-1105-0	ROOF PLAN	CXF-S-07
1-118-S-1106-0	SECTIONS & DETAILS	CXF-S-08
1-118-S-1107-0	TYPICAL SECTIONS & DETAILS	CXF-S-09
1-118-S-1108-0	SECTIONS & DETAILS	CXF-S-10
 <i><u>FIRE PROTECTION</u></i>		
1-118-FP-1109-0	FIRE PROTECTION NOTES, SYMBOLS, ABBREV'S & DWG LIST	CXF-FP-01
1-118-FP-1110-0	FIRE PROTECTION GROUND FLOOR DEMOLITION RCP	CXF-FP-11
1-118-FP-1111-0	FIRE PROTECTION GROUND FLOOR CONSTRUCTION RCP	CXF-FP-21
1-118-FP-1112-0	FIRE PROTECTION DETAILS	CXF-FP-81
 <i><u>PLUMBING</u></i>		
1-118-P-1113-0	PLUMBING NOTES, SYMBOLS, ABBREV'S, & DWG LIST	CXF-P-01
1-118-P-1114-0	PLUMBING GROUND FLOOR DEMOLITION PLAN	CXF-P-11
1-118-P-1115-0	PLUMBING FIRST FLOOR CONSTRUCTION PLAN	CXF-P-21
1-118-P-1116-0	PLUMBING DETAILS	CXF-P-81
 <i><u>MECHANICAL</u></i>		
1-118-P-1117-0	MECHANICAL NOTES, SYMBOLS AND LEGENDS	CXF-M-01
1-118-P-1118-0	MECHANICAL FIRST FLOOR CONSTRUCTION PLAN	CXF-M-21
1-118-P-1119-0	MECHANICAL ROOF CONSTRUCTION PLAN	CXF-M-22
1-118-P-1120-0	MECHANICAL SCHEDULES	CXF-M-61
1-118-P-1121-0	MECHANICAL DETAILS	CXF-M-81
1-118-P-1122-0	MECHANICAL CONTROLS	CXF-M-91
 <i><u>ELECTRICAL</u></i>		
1-118-E-1123-0	ONE LINE DIAGRAM- DEMOLITION	CXF-E-01
1-118-E-1124-0	GROUND FLOOR DEMOLITION- POWER & LIGHTING PLAN	CXF-E-02
1-118-E-1125-0	SITE DUCTBANK PLAN	CXF-E-03
1-118-E-1126-0	ONE LINE DIAGRAM	CXF-E-04
1-118-E-1127-0	GROUND FLOOR- POWER PLAN	CXF-E-05
1-118-E-1128-0	GROUND FLOOR - LIGHTING PLAN	CXF-E-06
1-118-E-1129-0	ROOF LEVEL - POWER & LIGHTING PLAN	CXF-E-07
1-118-E-1130-0	PANEL SCHEDULES	CXF-E-08
 <i><u>FIRE ALARM</u></i>		
1-118-FA-1131-0	FIRE ALARM NOTES, SYMBOLS, LEGEND, & RISER DIAGRAM	CXF-FA-01
1-118-FA-1132-0	FIRE ALARM FIRST FLOOR DEMOLITION PLAN	CXF-FA-11
1-118-FA-1133-0	FIRE ALARM FIRST FLOOR PLAN	CXF-FA-21
1-118-FA-1134-0	FIRE ALARM DETAILS	CXF-FA-81
 <i><u>CIVIL</u></i>		
1-118-C-1135-0	OVERALL SITE PLAN	CXF-C-01
1-118-C-1136-0	EXISTING CONDITIONS/ DEMOLITION PLAN	CXF-C-02
1-118-C-1137-0	SITE CONSTRUCTION PLAN	CXF-C-03
1-118-C-1138-0	UTILITY CONSTRUCTION PLAN	CXF-C-04
1-118-C-1139-0	GRADING AND EROSION CONTROL PLAN	CXF-C-05
1-118-C-1140-0	OVERALL SITE PLAN	CXF-C-06
1-118-C-1141-0	OVERALL SITE PLAN	CXF-C-07

DRAGON COASTER VENDORS (DCV)

GENERAL

1-118-G-1142-0	BUILDING INTRO	DCV-G-01
1-118-G-1143-0	LIFE SAFETY PLAN	DCV-G-02
1-118-G-1144-0	SITE RESTORATION PLAN	DCV-G-03

ENVIRONMENTAL

1-118-G-1145-0	GENERAL ASBESTOS ABATEMENT NOTES	DCV-H-10
1-118-G-1146-0	GROUND FLOOR- ASBESTOS ABATEMENT PLAN	DCV-H-11
1-118-G-1147-0	GENERAL LEAD REMEDIATION NOTES	DCV-H-20
1-118-G-1148-0	NORTH AND SOUTH ELEVATION LEAD REMEDIATION PLAN	DCV-H-21

ARCHITECTURAL

1-118-A-1149-0	DEMOLITION PLAN	DCV-A-01
1-118-A-1150-0	DEMOLITION REFLECTED CEILING PLAN	DCV-A-02
1-118-A-1151-0	DEMOLITION ROOF PLAN	DCV-A-03
1-118-A-1152-0	DEMOLITION ELEVATIONS 1 OF 3	DCV-A-04
1-118-A-1153-0	DEMOLITION ELEVATIONS 2 OF 3	DCV-A-05
1-118-A-1154-0	DEMOLITION ELEVATIONS 3 OF 3	DCV-A-06
1-118-A-1155-0	DEMOLITION SECTION	DCV-A-07
1-118-A-1156-0	GROUND FLOOR- CONSTRUCTION PLAN	DCV-A-10
1-118-A-1157-0	GROUND FLOOR- REFLECTED CEILING PLAN	DCV-A-11
1-118-A-1158-0	ATTIC PLAN	DCV-A-12
1-118-A-1159-0	ROOF PLAN	DCV-A-13
1-118-A-1160-0	FINISH PLAN	DCV-A-14
1-118-A-1161-0	EXTERIOR ELEVATIONS 1 OF 3	DCV-A-20
1-118-A-1162-0	EXTERIOR ELEVATIONS 2 OF 3	DCV-A-21
1-118-A-1163-0	EXTERIOR ELEVATIONS 3 OF 3	DCV-A-22
1-118-A-1164-0	SECTION AT DIAGONAL COLONNADE AND DRAGON COASTER STATION	DCV-A-30
1-118-A-1165-0	SECTION AT TOWER 6 AND GUEST SERVICES	DCV-A-31
1-118-A-1166-0	SECTION AT TICKET ROOM	DCV-A-32
1-118-A-1167-0	SECTION AT VENDOR SPACE	DCV-A-33
1-118-A-1168-0	ENLARGED COLONNADE SECTION AND ELEVATION- EXTERIOR	DCV-A-50
1-118-A-1169-0	ENLARGED COLONNADE SECTION- INTERIOR	DCV-A-51
1-118-A-1170-0	ENLARGED TOWER SECTIONS	DCV-A-52
1-118-A-1171-0	ENLARGED EXTERIOR ELEVATIONS	DCV-A-53
1-118-A-1172-0	ENLARGED PLANS AT COURTYARD	DCV-A-54
1-118-A-1173-0	CUSTOM FABRICATIONS	DCV-A-80
1-118-A-1174-0	TOWER DETAILS	DCV-A-81
1-118-A-1175-0	TOWER PIER DETAILS	DCV-A-82
1-118-A-1176-0	COLUMN DETAILS 1 OF 2	DCV-A-83
1-118-A-1177-0	COLUMN DETAILS 2 OF 2	DCV-A-84
1-118-A-1178-0	BALUSTRADE AND MOUNTING DETAILS	DCV-A-85
1-118-A-1179-0	MILLWORK DETAILS	DCV-A-86
1-118-A-1180-0	LIGHTING AND FLAG MOUNTING DETAILS AT BALUSTRADE	DCV-A-87

1-118-A-1181-0	ROOF DETAILS	DCV-A-88
1-118-A-1182-0	DRAGON COASTER TICKET BOOTH DETAILS	DCV-A-90
1-118-A-1183-0	COUNTER DOOR DETAILS	DCV-A-91
1-118-A-1184-0	ROLL UP DOOR DETAILS	DCV-A-92
1-118-A-1185-0	FENCE DETAILS	DCV-A-93
1-118-A-1186-0	SIGNAGE DETAILS	DCV-A-94
1-118-A-1187-0	DOOR AND HARDWARE SCHEDULE	DCV-A-95
1-118-A-1188-0	WINDOW SCHEDULE AND WINDOW DETAILS	DCV-A-96
1-118-A-1189-0	WALL PARTITION SCHEDULE	DCV-A-97
1-118-A-1190-0	EXTERIOR PAINT FINISH SCHEDULE 1 OF 2	DCV-A-98
1-118-A-1191-0	EXTERIOR PAINT FINISH SCHEDULE 2 OF 2	DCV-A-99

STRUCTURAL

1-118-S-1192-0	STRUCTURAL NOTES	DCV-S-01
1-118-S-1193-0	STRUCTURAL ABBREVIATIONS & SYMBOLS	DCV-S-02
1-118-S-1194-0	DEMOLITION- GROUND FLOOR PLAN	DCV-S-03
1-118-S-1195-0	DEMOLITION- SECTION	DCV-S-04
1-118-S-1196-0	SHORING PLAN	DCV-S-05
1-118-S-1197-0	FOUNDATION PLAN	DCV-S-06
1-118-S-1198-0	TOWER FOUNDATION PLAN, SECTION AND DETAILS	DCV-S-07
1-118-S-1199-0	GROUND FLOOR PLAN	DCV-S-08
1-118-S-1200-0	TOWER SUPERSTRUCTURE- PLANS	DCV-S-09
1-118-S-1201-0	CEILING FRAMING PLAN	DCV-S-10
1-118-S-1202-0	TOWER SUPERSTRUCTURE- PLANS II	DCV-S-11
1-118-S-1203-0	SECTION	DCV-S-12
1-118-S-1204-0	SECTION	DCV-S-13
1-118-S-1205-0	TOWER SUPERSTRUCTURE - SECTIONS AND DETAILS	DCV-S-14
1-118-S-1206-0	TYPICAL SECTIONS AND DETAILS	DCV-S-15
1-118-S-1207-0	SECTIONS AND DETAILS	DCV-S-16
1-118-S-1208-0	PART PLAN AND SECTIONS	DCV-S-17

FIRE PROTECTION

1-118-FP-1209-0	FIRE PROTECTION NOTES, SYMBOLS, ABBREVIATIONS & DWG LIST	DCV-FP-01
1-118-FP-1210-0	FIRE PROTECTION FIRST FLOOR DEMOLITION RCP	DCV-FP-11
1-118-FP-1211-0	FIRE PROTECTION FIRST FLOOR CONSTRUCTION RCP	DCV-FP-21
1-118-FP-1212-0	FIRE PROTECTION DETAILS	DCV-FA-81

PLUMBING

1-118-P-1213-0	PLUMBING NOTES, SYMBOLS, ABBREVIATIONS, AND DRAWING LIST	DCV-P-01
1-118-P-1214-0	PLUMBING FIRST FLOOR AND ROOF DEMOLITION PLANS	DCV-P-11
1-118-P-1215-0	PLUMBING FIRST FLOOR AND ROOF CONSTRUCTION PLAN	DCV-P-21
1-118-P-1216-0	PLUMBING DETAILS	DCV-P-81

MECHANICAL

1-118-M-1217-0	MECHANICAL NOTES, SYMBOLS & LEGENDS	DCV-M-01
1-118-M-1218-0	MECHANICAL FIRST FLOOR DEMOLITION PLAN	DCV-M-11
1-118-M-1219-0	MECHANICAL ROOF DEMOLITION PLAN	DCV-M-12
1-118-M-1220-0	MECHANICAL FIRST FLOOR CONSTRUCTION PLAN	DCV-M-21
1-118-M-1221-0	MECHANICAL ATTIC CONSTRUCTION PLAN	DCV-M-22
1-118-M-1222-0	MECHANICAL SCHEDULES	DCV-M-61
1-118-M-1223-0	MECHANICAL DETAILS AND CONTROLS	DCV-M-81

ELECTRICAL

1-118-E-1224-0	ONE LINE DIAGRAM- DEMOLITION	DCV-E-01
1-118-E-1225-0	VENDORS GROUND FLOOR- DEMOLITION	DCV-E-02
1-118-E-1226-0	COLONNADE & TOWERS - DEMOLITION	DCV-E-03
1-118-E-1227-0	ROOF PLAN - DEMOLITION	DCV-E-04
1-118-E-1228-0	ONE LINE DIAGRAM & PANE; SCHEDULES	DCV-E-05
1-118-E-1229-0	GROUND FLOOR - POWER PLAN	DCV-E-06
1-118-E-1230-0	GROUND FLOOR - LIGHTING PLAN	DCV-E-07
1-118-E-1231-0	ROOF PLAN- POWER, LIGHTING & LIGHTNING PROTECTION	DCV-E-08
1-118-E-1232-0	EXTERIOR LIGHTING CONTROLS	DCV-E-09

FIRE ALARM

1-118-FA-1233-0	FIRE ALARM NOTES, SYMBOLS, LEGEND, AND RISER DIAGRAM	DCV-FA-01
1-118-FA-1234-0	FIRE ALARM FIRST FLOOR DEMOLITION PLAN	DCV-FA-11
1-118-FA-1235-0	FIRE ALARM GROUND FLOOR PLAN	DCV-FA-21
1-118-FA-1236-0	FIRE ALARM ROOF PLAN	DCV-FA-22
1-118-FA-1237-0	FIRE ALARM DETAILS	DCV-FA-81

CIVIL

1-118-C-1238-0	GENERAL NOTES	DCV-C-01
1-118-C-1239-0	EXISTING CONDITIONS/ DEMOLITION PLAN	DCV-C-02
1-118-C-1240-0	SITE CONSTRUCTION PLAN	DCV-C-03
1-118-C-1241-0	UTILITY CONSTRUCTION PLAN	DCV-C-04
1-118-C-1242-0	GRADING AND EROSION CONTROL PLAN	DCV-C-05
1-118-C-1243-0	CIVIL DETAILS 1	DCV-C-06
1-118-C-1244-0	CIVIL DETAILS 2	DCV-C-07

RESTAURANT KITCHEN WITH FOOD VENDING (K)

GENERAL

1-118-G-1245-0	BUILDING 3D VIEW	K-G-01
1-118-G-1246-0	CODE PLAN	K-G-02

ENVIRONMENTAL

1-118-G-1247-0	GENERAL ASBESTOS ABATEMENT NOTES	K-H-10
1-118-G-1248-0	GROUND FLOOR AND ELEVATIONS ASBESTOS REMOVAL PLAN	K-H-11
1-118-G-1249-0	GENERAL LEAD REMEDIATION NOTES	K-H-20
1-118-G-1250-0	GROUND FLOOR AND ELEVATION LEAD REMEDIATION PLAN	K-H-21

ARCHITECTURAL

1-118-A-1251-0	GROUND FLOOR DEMOLITION PLAN	K-A-01
1-118-A-1252-0	GROUND FLOOR DEMOLITION- REFLECTED CEILING PLANS	K-A-02
1-118-A-1253-0	ROOF DEMOLITION PLAN	K-A-03
1-118-A-1254-0	EXTERIOR DEMOLITION ELEVATIONS	K-A-04
1-118-A-1255-0	EXTERIOR DEMOLITION ELEVATIONS	K-A-05
1-118-A-1256-0	GROUND FLOOR CONSTRUCTION PLAN	K-A-11
1-118-A-1257-0	ATTIC AND LOW ROOF CONSTRUCTION PLAN	K-A-12
1-118-A-1258-0	GROUND FLOOR- REFLECTED CEILING PLANS	K-A-13
1-118-A-1259-0	ATTIC REFLECTED CEILING PLAN	K-A-14
1-118-A-1260-0	ROOF CONSTRUCTION PLAN	K-A-15
1-118-A-1261-0	EXTERIOR BUILDING ELEVATIONS- EAST AND SOUTH	K-A-21
1-118-A-1262-0	EXTERIOR BUILDING ELEVATIONS- NORTH AND WEST	K-A-22
1-118-A-1263-0	BUILDING SECTIONS	K-A-31
1-118-A-1264-0	BUILDING SECTIONS 2	K-A-32
1-118-A-1265-0	CEILING, FLOOR, AND PLANTER DETAILS	K-A-81
1-118-A-1266-0	ROOF DETAILS	K-A-82
1-118-A-1267-0	ROOF SIGNAGE DETAILS	K-A-83
1-118-A-1268-0	COLUMN DETAILS	K-A-84
1-118-A-1269-0	CANOPY DETAILS	K-A-85
1-118-A-1270-0	COUNTER ROLL UP DOOR DETAILS	K-A-86
1-118-A-1271-0	SIGNAGE DETAILS	K-A-87
1-118-A-1272-0	WINDOW SCHEDULES & DETAILS	K-A-88
1-118-A-1273-0	FINISHES & MATERIAL SCHEDULE	K-A-91
1-118-A-1274-0	EXTERIOR FINISH ELEVATIONS & DETAILS	K-A-92
1-118-A-1275-0	DOOR & FRAME DETAILS	K-A-93
1-118-A-1276-0	WALL PARTITION SCHEDULE	K-A-94

STRUCTURAL

1-118-S-1277-0	STRUCTURAL NOTES	K-S-01
1-118-S-1278-0	STRUCTURAL ABBREVIATIONS & SYMBOLS	K-S-02
1-118-S-1279-0	DEMOLITION- GROUND FLOOR PLAN	K-S-03
1-118-S-1280-0	DEMOLITION- ROOF PLAN	K-S-04
1-118-S-1281-0	SHORING PLAN	K-S-05
1-118-S-1282-0	FOUNDATION PLAN	K-S-06
1-118-S-1283-0	GROUND FLOOR PLAN	K-S-07
1-118-S-1284-0	CEILING FRAMING PLAN	K-S-08
1-118-S-1285-0	ROOF PLAN	K-S-09
1-118-S-1286-0	SECTION	K-S-10
1-118-S-1287-0	SECTIONS AND DETAILS	K-S-11
1-118-S-1288-0	SECTIONS AND DETAILS	K-S-12
1-118-S-1289-0	SECTIONS AND DETAILS	K-S-13

FIRE PROTECTION

1-118-FP-1290-0	FIRE PROTECTION NOTES, SYMBOLS, ABBREVIATIONS & DWG LIST	K-FP-01
1-118-FP-1291-0	FIRE PROTECTION GROUND FLOOR DEMOLITION PLAN	K-FP-11
1-118-FP-1292-0	FIRE PROTECTION GROUND FLOOR AND ATTIC CONSTRUCTION RCP	K-FP-21
1-118-FP-1293-0	FIRE PROTECTION DETAILS	K-FP-81

PLUMBING

1-118-P-1294-0	PLUMBING NOTES, SYMBOLS, ABBREVIATIONS AND DRAWING LIST	K-P-01
1-118-P-1295-0	PLUMBING GROUND FLOOR DEMOLITION PLAN	K-P-11
1-118-P-1296-0	PLUMBING GROUND FLOOR CONSTRUCTION PLAN	K-P-21
1-118-P-1297-0	PLUMBING DETAILS	K-P-81

MECHANICAL

1-118-M-1298-0	MECHANICAL NOTES, SYMBOLS AND LEGENDS	K-M-01
1-118-M-1299-0	MECHANICAL FIRST FLOOR DEMOLITION PLAN	K-M-11
1-118-M-1300-0	MECHANICAL ROOF DEMOLITION PLAN	K-M-12
1-118-M-1301-0	MECHANICAL FIRST FLOOR CONSTRUCTION PLAN	K-M-21
1-118-M-1302-0	MECHANICAL ATTIC FLOOR CONSTRUCTION PLAN	K-M-22
1-118-M-1303-0	MECHANICAL ROOF CONSTRUCTION PLAN	K-M-23
1-118-M-1304-0	MECHANICAL SCHEDULES	K-M-61
1-118-M-1305-0	MECHANICAL DETAILS 1 OF 2	K-M-81
1-118-M-1306-0	MECHANICAL DETAILS 2 OF 2	K-M-82
1-118-M-1307-0	MECHANICAL CONTROLS	K-M-91

ELECTRICAL

1-118-E-1308-0	ONE LINE DIAGRAM- DEMOLITION	K-E-01
1-118-E-1309-0	GROUND FLOOR - DEMOLITION POWER & LIGHTING PLAN	K-E-02
1-118-E-1310-0	ROOF DEMOLITION PLAN	K-E-03
1-118-E-1311-0	SITE DUCTBANK PLAN	K-E-04
1-118-E-1312-0	ONE LINE DIAGRAMS & EXTERIOR LIGHTING CONTROL	K-E-05
1-118-E-1313-0	PANEL SCHEDULES	K-E-06
1-118-E-1314-0	GROUND FLOOR - POWER PLAN	K-E-07
1-118-E-1315-0	SECOND LEVEL- POWER PLAN	K-E-08
1-118-E-1316-0	GROUND FLOOR - LIGHTING PLAN	K-E-09
1-118-E-1317-0	SECOND FLOOR - LIGHTING PLAN	K-E-10
1-118-E-1318-0	ROOF PLAN - POWER & LIGHTING PROTECTION	K-E-11

FIRE ALARM

1-118-FA-1319-0	FIRE ALARM NOTES, SYMBOLS, LEGEND, & RISER DIAGRAM	K-FA-01
1-118-FA-1320-0	FIRE ALARM FIRST FLOOR DEMOLITION PLAN	K-FA-11
1-118-FA-1321-0	FIRE ALARM FIRST FLOOR PLAN	K-FA-21
1-118-FA-1322-0	FIRE ALARM ATTIC FLOOR PLAN	K-FA-22
1-118-FA-1323-0	FIRE ALARM DETAILS	K-FA-81

CIVIL

1-118-C-1324-0	GENERAL NOTES	K-C-01
1-118-C-1325-0	EXISTING CONDITIONS/ DEMOLITION PLAN	K-C-02
1-118-C-1326-0	SITE CONSTRUCTION PLAN	K-C-03
1-118-C-1327-0	UTILITY CONSTRUCTION PLAN	K-C-04
1-118-C-1328-0	GRADING AND EROSION CONTROL PLAN	K-C-05
1-118-C-1329-0	CIVIL DETAILS 1	K-C-06
1-118-C-1330-0	CIVIL DETAILS 2	K-C-07

SOUTHEAST ARCADE (SA)

GENERAL

1-118-G-1331-0	BUILDING INTRO	SA-G-01
1-118-G-1332-0	EGRESS PLANS AND CODE ANALYSIS	SA-G-02
1-118-G-1333-0	SITE RESTORATION PLAN	SA-G-03

ENVIRONMENTAL

1-118-G-1334-0	GENERAL LEAD REMEDIATION NOTES	SA-H-20
1-118-G-1335-0	NORTH AND EAST ELEVATIONS- LEAD REMEDIATION PLAN	SA-H-21
1-118-G-1336-0	WEST ELEVATION- LEAD REMEDIATION PLAN	SA-H-22

ARCHITECTURAL

1-118-A-1337-0	SE ARCADE GROUND FLOOR - DEMOLITION PLAN	SA-A-01
1-118-A-1338-0	SE GROUND FL DEMOLITION - REFLECTED CEILING PLAN	SA-A-02
1-118-A-1339-0	SE ARCADE SECOND FLOOR - DEMOLITION PLAN & RCP	SA-A-03
1-118-A-1340-0	SE ARCADE ROOF FLOOR - DEMOLITION PLAN	SA-A-04
1-118-A-1341-0	SE ARCADE EXTERIOR DEMOLITION ELEVATIONS 1	SA-A-05
1-118-A-1342-0	SE ARCADE EXTERIOR DEMOLITION ELEVATIONS 2	SA-A-06
1-118-A-1343-0	SE ARCADE GROUND FLOOR PLAN	SA-A-11
1-118-A-1344-0	SE ARCADE REFLECTED CEILING PLANS	SA-A-12
1-118-A-1345-0	SE ARCADE MEZZANINE - PLANS & RCP	SA-A-13
1-118-A-1346-0	SE ARCADE ROOF PLAN	SA-A-14
1-118-A-1347-0	SE ARCADE FINISH PLANS	SA-A-15
1-118-A-1348-0	EXTERIOR BUILDING ELEVATIONS 1	SA-A-21
1-118-A-1349-0	EXTERIOR BUILDING ELEVATIONS 2	SA-A-22
1-118-A-1350-0	INTERIOR BUILDING SECTIONS 1 OF 2	SA-A-31
1-118-A-1351-0	INTERIOR BUILDING SECTIONS 2 OF 2	SA-A-32
1-118-A-1352-0	STAIR DETAILS	SA-A-71
1-118-A-1353-0	CANOPY DETAILS	SA-A-81
1-118-A-1354-0	SIGNAGE DETAILS	SA-A-82
1-118-A-1355-0	FENCE DETAILS	SA-A-83
1-118-A-1356-0	CEILING DETAILS	SA-A-84
1-118-A-1357-0	ROOF MONITOR DETAILS	SA-A-85
1-118-A-1358-0	DOOR & HARDWARE SCHEDULE	SA-A-91
1-118-A-1359-0	WINDOW, LOUVERS SCHEDULES & DETAILS	SA-A-92
1-118-A-1360-0	PARTITION TYPES AND FLOORING DETAILS	SA-A-93
1-118-A-1361-0	COLUMN DETAILS	SA-A-94

STRUCTURAL

1-118-S-1362-0	STRUCTURAL NOTES	SA-S-01
1-118-S-1363-0	STRUCTURAL ABBREVIATIONS & SYMBOLS	SA-S-02
1-118-S-1364-0	DEMOLITION- GROUND FLOOR PLAN	SA-S-03
1-118-S-1365-0	DEMOLITION- ROOF PLAN	SA-S-04
1-118-S-1366-0	FOUNDATION PLAN	SA-S-05
1-118-S-1367-0	GROUND FLOOR PLAN	SA-S-06
1-118-S-1368-0	SECTIONS AND DETAILS	SA-S-07
1-118-S-1369-0	SECTIONS	SA-S-08
1-118-S-1370-0	SECTIONS AND DETAILS	SA-S-09
1-118-S-1371-0	SECTIONS AND DETAILS	SA-S-10
1-118-S-1372-0	SECTIONS AND DETAILS	SA-S-11
1-118-S-1373-0	SECTIONS AND DETAILS	SA-S-12

FIRE PROTECTION

1-118-FP-1374-0	FIRE PROTECTION NOTES, SYMBOLS, ABBREV'S & DWG LIST	SA-FP-01
1-118-FP-1375-0	FIRE PROTECTION GROUND AND SECOND FLOOR DEMOLITION RCP	SA-FP-11
1-118-FP-1376-0	FIRE PROTECTION GROUND AND SECOND FLOOR CONSTRUCTION RCP	SA-FP-21
1-118-FP-1377-0	FIRE PROTECTION DETAILS	SA-FP-81

PLUMBING

1-118-P-1378-0	PLUMBING NOTES, SYMBOLS, ABBREV'S & DRAWING LIST	SA-P-01
1-118-P-1379-0	PLUMBING GROUND FL & 2ND LEVEL DEMOLITION PLANS	SA-P-11
1-118-P-1380-0	PLUMBING GROUND FL & 2ND LEVEL CONSTRUCTION PLANS	SA-P-21
1-118-P-1381-0	PLUMBING DETAILS	SA-P-81

MECHANICAL

1-118-M-1382-0	MECHANICAL NOTES, SYMBOLS & LEGENDS	SA-M-01
1-118-M-1383-0	MECHANICAL FIRST FLOOR DEMOLITION PLAN	SA-M-11
1-118-M-1384-0	MECHANICAL SECOND FLOOR DEMOLITION PLAN	SA-M-12
1-118-M-1385-0	MECHANICAL FIRST FLOOR CONSTRUCTION PLAN	SA-M-21
1-118-M-1386-0	MECHANICAL SECOND FLOOR CONSTRUCTION PLAN	SA-M-22
1-118-M-1387-0	MECHANICAL EXTERIOR BUILDING ELEVATIONS	SA-M-23
1-118-M-1388-0	MECHANICAL SCHEDULES	SA-M-61
1-118-M-1389-0	MECHANICAL DETAILS	SA-M-81
1-118-M-1390-0	MECHANICAL CONTROLS	SA-M-91

ELECTRICAL

1-118-E-1391-0	ONE LINE DIAGRAMS & PANEL SCHEDULES - DEMOLITION	SA-E-01
1-118-E-1392-0	GROUND FLOOR - DEMOLITION POWER & LIGHTING PLAN	SA-E-02
1-118-E-1393-0	SECOND LEVEL - DEMOLITION PLAN	SA-E-03
1-118-E-1394-0	ONE LINE DIAGRAM & PANEL SCHEDULES	SA-E-04
1-118-E-1395-0	GROUND FLOOR - POWER PLAN	SA-E-05
1-118-E-1396-0	SECOND LEVEL - POWER PLAN	SA-E-06
1-118-E-1397-0	GROUND FLOOR - LIGHTING PLAN	SA-E-07
1-118-E-1398-0	SECOND LEVEL - LIGHTING PLAN	SA-E-08
1-118-E-1399-0	ROOF PLAN - LIGHTNING PROTECTION	SA-E-09

FIRE ALARM

1-118-FA-1400-0	FIRE ALARM NOTES, SYMBOLS, LEGEND, AND RISER DIAGRAM	SA-FA-01
1-118-FA-1401-0	FIRE ALARM FIRST FLOOR DEMOLITION PLAN	SA-FA-11
1-118-FA-1402-0	FIRE ALARM FIRST FLOOR PLAN	SA-FA-21
1-118-FA-1403-0	FIRE ALARM SECOND FLOOR PLAN	SA-FA-22
1-118-FA-1404-0	FIRE ALARM DETAILS	SA-FA-81

CIVIL

1-118-C-1405-0	GENERAL NOTES	SA-C-01
1-118-C-1406-0	EXISTING CONDITIONS/ DEMOLITION PLAN	SA-C-02
1-118-C-1407-0	SITE CONSTRUCTION PLAN	SA-C-03
1-118-C-1408-0	UTILITY CONSTRUCTION PLAN	SA-C-04
1-118-C-1409-0	GRADING AND EROSION CONTROL PLAN	SA-C-05
1-118-C-1410-0	CIVIL DETAILS 1	SA-C-06
1-118-C-1411-0	CIVIL DETAILS 2	SA-C-07

DETAILS (ELECTRICAL)

1-118-E-1412-0	DETAILS 1	DT-E-01
1-118-E-1413-0	DETAILS 2	DT-E-02

Submit all proposal pages in this section, including all executed and unexecuted pages and fasten with a clip at the upper left hand corner.



George Latimer, Westchester County Executive

PROPOSAL PAGES

TITLE

**INFRASTRUCTURE REHABILITATION – PHASE 3
PLAYLAND PARK
RYE, NEW YORK**

Contract No. 22-523

Bid Opening: October 5, 2022

By Bidder (Please Print) Firm/Business Name: _____ Address: _____ _____	For Official Use Only _____ _____
-----------------------------------------------------------------------------------------	------------------------------------------------

**DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION
Division of Engineering**

PROPOSAL REQUIREMENTS

BIDDER'S IDENTIFICATION

CONTRACT NO. _____

To the Commissioner of Public Works, Westchester County, New York, acting for the party of the first part.

Proposal made by _____
as party of the second part.

Whose business address is _____

Whose telephone number is _____

Whose E-mail address is _____

Whose Federal ID number is _____

Is bidder an individual,
a partnership or a corporation? _____

If a partnership or corporation,
give the names of all partners
or officers with their titles _____

If operating under a trade name or as partners, has the required Certificate been filed with a County Clerk in accordance with the General Business Law, Section 130?

Yes....[] No....[] N.A....[]

If the answer is NO, Certificate must be filed before the contract can be executed.

NOTE: the bid must be submitted using the Contractor's legal name, not just the "doing business as" (i.e. DBA) name.

COMPLETE THIS FORM USING BLACK INK ONLY

PROPOSAL REQUIREMENTS

1. The undersigned, the bidder, does hereby declare that it has carefully read the contract specifications and has carefully studied the relevant plans, profiles and other drawings (as defined in Article "Contract Drawings" of the General Requirements) relating to the contract work, and has inspected the site(s) of the work..
2. The undersigned does hereby declare that it is the only one interested in its indicated bid; that the bid is in all respects without fraud or reservations; and that no official of the County or of the participating municipalities (if any), or any person in the employ of the County of participating municipalities (if any) is directly interested in the contract bid or in the supplies, equipment or works to which it relates, or in any part of the profits resulting there-from.
3. The undersigned does hereby offer and agree to furnish all materials, to fully and faithfully construct, perform and execute all work under the contract in accordance with the plans, profiles, other drawings and specifications relating thereto, and to furnish all labor, tools, implements, machinery, forms, transportation and materials necessary and proper for said purpose at the following indicated lump sum price for the total work and/or the following indicated unit prices for the various items of the work.
4. The undersigned does hereby declare that the indicated price(s) cover all expenses of every kind incidental to the completion of the contract work, including all claims affecting the work, labor and materials, which may arise through any cause whatsoever, excepting as provided for in Article "Disputed Work-Notice Of Claims For Damages: of the General Clauses.
5. The undersigned hereby agrees that in the event that the quantities of contract work actually performed by the undersigned are less than the approximate quantities indicated in the specifications it will make no claim(s) for loss of anticipated profits.
6. The undersigned does hereby agree that it will execute a contract containing all the terms, conditions, provisions and covenants necessary to complete the work according to the appropriate plans and specifications, within ten working days after receipt by the undersigned of the contract from the County, and that if it fails to execute said contract within said period of time the County may rescind the contract award and may retain as liquidated damages and not as a penalty, any amounts submitted as the bid security accompanying the undersigned's proposal, and/or demand from the Bidder's Surety Company that executed the required Bid Bond and Consent of Surety to pay to the County the difference between the amount bid and the amount for which such contract is thereafter awarded, together with the cost to the County of reletting said contract up to the maximum aggregate amount of 25% of the amount bid.
7. The undersigned does hereby agree to commence the work encompassed under the contract within ten days after notification in writing from the Commissioner of Public Works or his authorized designee, unless a definite earlier or later start has been specified, and will complete the work fully and in every respect on or before the specified completion date; and further agrees that the County has the right to employ such combination of labor, equipment

PROPOSAL REQUIREMENTS

and materials as may be required for the proper completion of the contract work and to deduct all costs from such monies as may be due the undersigned, in the event the contract work is not completed by the specified completion date.

- 8. The undersigned does hereby agree to comply with all relevant provisions of the Labor Laws of the State of New York, and agrees to adhere to the provisions relating to the eight-hour day and five-day week, the payments of minimum rates for labor, and the latest laws relative to payments for wages for labor on public contracts.

- 9. The undersigned does hereby agree to insure all persons connected with the contract work against accident, at its own expense, as prescribed by the Workmen's Compensation Law of the State of New York; and that it will be responsible for payments by itself, its subcontractors and vendors of all taxes applicable to the work, and all other payments as may be required by various laws and rules and regulations of the Federal Government, the State of New York and its political subdivisions and agencies, such payments including but not limited to the following:
 - A. Federal Social Security Taxes on employees' wages.
 - B. Applicable Federal Excise Taxes.
 - C. New York State Unemployment Insurance and Disability Payments, based on employees' wages.

- 10. The undersigned does hereby agree to accept their indicated lump sum price for the total work and/or their indicated unit prices for the various items of the work as the sole basis in the determination of the value of addition to, or deletions from the specified scope of the contract work.

11. ADDENDUM RECEIPT - CONTRACT NO. _____

(The undersigned shall fill in contract number above, and the required information below.)

The undersigned does hereby acknowledge receipt of the below listed addenda to the contract specifications:

Addendum No. _____	Dated _____
Addendum No. _____	Dated _____
Addendum No. _____	Dated _____
Addendum No. _____	Dated _____
Addendum No. _____	Dated _____

COMPLETE THIS FORM USING BLACK ONLY

PROPOSAL REQUIREMENTS

12. Bidders should not submit the entire Bid document with its bid submission. Instead, Bidders must submit ALL of the Proposal Pages. Proposal Pages are denoted by a border and are titled on the bottom as "Proposal Page ___".

Be sure that, where required, the forms have been completed and signed by a notary public.

Proposal Page 12 must be completed by a surety company and submitted with the bid if a Performance and Payment Bond is required in accordance with the "Notice to Contractors".

13. NON-COLLUSIVE BIDDING CERTIFICATION

Made pursuant to Section 103-d of the General Municipal Law of the State of New York as amended by the Laws of 1966.

- A. 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 his 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 which have been 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.
- B. A bid shall not be considered for award nor shall any award be made where a. (1), (2) and (3), above, have not been complied with; provided however, that if any case the bidder cannot make the foregoing certification, the bidder shall so state and shall furnish with the bid a signed statement which sets forth in detail the reasons therefore. Where a. (1), (2) and (3), above, have not been complied with, the bid shall not be considered for award nor shall any award be made unless the head of the purchasing unit of the political subdivision, public department, agency or official thereof to which the bid is made, or his designee, determines that such disclosure was not added for the purpose of restricting competition."
14. The undersigned and each person signing in behalf of the undersigned hereby executes the foregoing Affirmative Action Questionnaire, Proposal, Addendum Receipt and Non-Collusive Bidding Certification.
15. The undersigned and each person signing on behalf of the undersigned hereby certifies that

PROPOSAL REQUIREMENTS

the person, firm or corporation submitting this proposal as the bidder has not been found guilty of a willful violation of the New York State Labor Law for failure to pay prevailing wages and supplements, as those terms are defined by the New York State Labor Law, within the twelve (12) months immediately preceding the submission of this bid.

16. The undersigned, by submitting the Proposal Pages, acknowledges that it has read the complete bid package including any and all addenda thereto and its bid includes all of the terms and conditions set forth in the bid documents, including, but not limited to, the Notice to Contractors, General Requirements and Proposals, Contract plans/drawings (if any), Proposal Forms, Information for Bidders, General Clauses, Sample Forms and Attachments, Sample Contract and Bond, Schedule of Hourly Rates and Supplements, Technical Specifications, any Special Notices and all applicable laws, rules and regulations. The undersigned further acknowledges that by submitting this bid the above denoted items are incorporated by reference and constitute an integral part of its bid.
17. The undersigned agrees that, if it is not the Successful bidder, the Sealed List of Subcontractors submitted with its bid can be destroyed by the County. **Please check the following box if you want the Sealed List of Subcontractors returned to you.**

Dated _____, 20__

Legal Name of Person, Firm or Corporation

(Seal of Corporation)

Business Address of Person, Firm or Corporation

By _____
Signature

Title

COMPLETE THIS FORM USING BLACK INK ONLY

ITEMIZED PROPOSAL

ITEM NO.	DESCRIPTION	AMOUNT BID	
		DOLLARS	CENTS
A	For providing all labor, material and equipment necessary to complete all work as shown on the contract drawings and in accordance with the specifications for the Infrastructure Rehabilitation – Phase 3, Playland Park, Rye, New York.	\$	
B	Contract Bonds and Insurance (Must not exceed 3.00% of Item A shown above)	\$	
W800	Necessary for Miscellaneous Additional Work per Article “Miscellaneous Additional Work (Item W-800)” of Information for Bidders, as directed	\$ 2,900,000	00
W851	Necessary for Testing of Materials and Field Testing Equipment per Article “Testing of Materials and Field Testing Equipment (Item W-851)” of General Requirements, as directed	\$ 100,000	00
GROSS SUM OF TOTAL BID (ITEMS A, B, W800 AND W851)		\$	

CONTRACTOR: _____

ADDRESS: _____

BY: _____

Signature/Title

CONTRACTOR'S ACKNOWLEDGMENT

(If Corporate)

STATE OF NEW YORK)
COUNTY OF WESTCHESTER) ss.:

On this _____ day of _____, 20____, before me personally came _____
_____ to me known and known to me to be the _____
_____ of _____ the corporation described in and which
executed the within instrument, who being by me duly sworn did depose and say that he the said_
_____ resides at _____
_____ and that he is _____ of said corporation and knows the corporate
seal of the said corporation; that the seal affixed to the within instrument is such corporate seal and
that it was so affixed by order of the Board of Directors of said corporation, and that he signed his
name thereto by like order.

Notary Public

CONTRACTOR'S ACKNOWLEDGMENT

(If Individual)

STATE OF NEW YORK)
COUNTY OF WESTCHESTER) ss.:

On this _____ day of _____, 20____, before me personally came _____
_____ to me known, and known to me to be the same person described in
and who executed the within instrument and he duly acknowledged to me that he executed the same
for the purpose herein mentioned and, if operating under the trade name, that the certificate required
by the New York State General Business Law Section 130 has been filed with the County Clerk of
Westchester County.

Notary Public

CONTRACTOR'S ACKNOWLEDGMENT

(If Co-Partnership)

STATE OF NEW YORK)
COUNTY OF WESTCHESTER) ss.:

On this _____ day of _____, 20____, before me personally came _____
_____ to me known, and known to me to be a member of the firm of
_____ and the person described in, and who executed the
within instrument in behalf of said firm, and he acknowledged to me that he executed the same in
behalf of, and as the act of said firm for the purposes herein mentioned and that the certificate
required by the New York State General Business Law Section 130 has been filed with the County
Clerk of Westchester County.

Notary Public

COMPLETE THIS FORM USING BLACK INK ONLY

CONTRACTOR'S ACKNOWLEDGMENT

(If Corporation/Sole Officer)

STATE OF NEW YORK)
) ss.:
COUNTY OF)

On this _____ day of _____, 20____, before me
personally came _____ to me known and
(Name)

known to me to be the _____
(Title)

of _____, the corporation described in and which
(Name of Corporation)

executed the within instrument, who being by me duly sworn did depose and say that he/she,
resides at _____

and that he/she signed the within instrument, on behalf of said corporation, in his/her capacity
as the _____ and sole officer and director of said corporation
(Title)

and that he/she owns all the issued and outstanding capital stock of said corporation.

Notary Public

COMPLETE THIS FORM USING BLACK INK ONLY

CERTIFICATE OF AUTHORITY

I, _____
(Officer other than officer executing proposed documents)

certify that I am _____ of the
(Title)

(Name of Contractor)

(the "Contractor"), a corporation duly organized and in good standing under the

(Law under which organized, e.g., the New York Business Corporation Law)

named in the foregoing agreement; that _____
(Person executing proposal documents)

who signed said agreement on behalf of the Contractor was, at the time of execution the

(Title of such person)

duly signed for and in behalf of said Contractor by authority of its Board of Directors, thereunto
duly organized, and that such authority is in full force and effect at the date hereof.

(Signature)

(SEAL)

STATE OF NEW YORK)
) ss.:
COUNTY OF)

On this _____ day of, _____, 20____, before me personally came
_____ to me known, and known to me to be
the _____ of _____, the
Corporation described in and which executed the above certificate, who being by me duly sworn did
depose and say that he, the said _____ resides at
_____ and that he is _____
_____ of said Corporation and knows the Corporate Seal of the said
Corporation; that the seal affixed to the above certificate is such Corporate Seal and that it was so
affixed by order of the Board of Directors of said Corporation, and that he signed his name thereto
by like order.

Notary Public

COMPLETE THIS FORM IN BLACK INK ONLY

CERTIFICATE OF AUTHORITY-LIMITED LIABILITY COMPANY

I, _____,
(member or manager other than person executing the agreement)

certify that I am a _____ of _____
(member/manager) (Name of Limited Liability Company)

(the "LLC") duly organized under the Laws of the State of _____; that
(Name of State)

_____ who signed said agreement on behalf of the LLC.
(Person Executing Agreement)

was, at the time of execution, a manager of the LLC; that said Contract was duly signed for and on behalf of said LLC and as the act of said LLC for the purposes herein mentioned.

(Signature)

STATE OF NEW YORK)
 ss.:
COUNTY OF _____)

On this _____ day of _____, 20____, before me personally came
_____, to me known, and known to me to be the _____
(name of member/manager) (member/manager)
described in and who executed the above certificate, who being be me duly sworn did depose and say that he resides at _____, and he is a (member/manager) of said LLC; that he is duly authorized to execute said certificate on behalf of said LLC, and that he signed his name thereto pursuant to such authority.

Notary Public County

My Commission Expires on: _____

COMPLETE THIS FORM USING BLACK INK ONLY

***Required for all Bids over \$100,000 where a Performance & Payment Bond
is Required in accordance with the "Notice to Contractors"***

CONTRACT NO. _____

BID BOND AND CONSENT OF SURETY

KNOW ALL PERSONS BY THESE PRESENTS, That _____
(Name of Contractor)

(Address)

(hereinafter called the "Principal") and the _____ a
corporation created and existing under the laws of the State of _____, having its principal office
at _____ (hereinafter called the "Surety"),

(PRINT FULL ADDRESS OF SURETY)

are held and firmly bound unto the County of Westchester (hereinafter called the "Obligee"), in the full just
sum of *Twenty-Five (25%) Percent of the Attached Bid*, good and lawful money of the United States of
America, for the payment of which said sum of money, well and truly to be made and done, the said
Principal binds themselves (himself/herself, itself), their (his/her, its) heirs, executors and administrators,
successors and assigns, and the said Surety binds itself, its successors and assigns jointly and severally,
firmly by these presents:

WHEREAS, the said Principal has submitted to the County of Westchester, New York, a
proposal/bid for Contract Number: _____
Project Title: _____ and

WHEREAS, under the terms of the Laws of the State of New York as above indicated, the said
Principal has filed or intends to file this bond to guarantee that the Principal will execute all required contract
documents, furnish all required insurance and furnish such Performance and Payment Bonds or other bonds
as may be required in accordance with the terms of the Principal's said proposal/bid.

NOW, THEREFORE, the Surety agrees:

(i) if the Contract for which the preceding estimate and proposal is made, is awarded to the Bidder by
the County, the Surety shall become bound as Surety and guarantor for the faithful performance of the
Contract and shall execute and deliver a Performance & Payment Bond, in a form acceptable to the County,
in the amount of 100% of the total Contract price, or such other amount as may be specified in the Bid
documents, and shall execute the Contract as party of the third part when required to do so by the Board of
Acquisition and Contract of the County; and

(ii) if the Bidder shall, upon award of the Contract to the Bidder, fail or refuse to execute the Contract
and furnish the necessary bonds and insurance certificates, the Surety shall, on demand by the County, pay to
the County the difference between the amount bid and the amount for which such contract is thereafter
awarded, together with the cost to the County of reletting said Contract, up to the maximum aggregate
amount of this bond.

(iii) the condition of the foregoing obligation is such, that if the said Principal shall promptly execute
and submit, and the County shall accept, all required contract documents including insurance and such
Performance and Payment Bond or other bonds, all as may be required in accordance with the terms of the
Principal's said bid/proposal, then this obligation shall be null and void, otherwise to remain in full force and
virtue.

The Surety, for value received, the receipt of which is hereby acknowledged by the Surety, hereby stipulates and agrees that the obligation of the Surety and of its bond shall remain absolute and shall be in no way impaired, affected or discharged by an extension of time, mutually agreed to by the County and the Bidder, within which the County may award said Contract, and the Surety hereby waives notice of any such extension.

IN TESTIMONY WHEREOF, the said Principal has hereunto set his/her (their, its) hand and the said Surety has caused this instrument to be signed by its duly authorized officer this _____ day of _____ 200__.

Signed and delivered this ____ day of _____ 20____ in the presence of:

(Print Name of Contractor)

_____ Principal
(Signature)

(Title of Authorized Officer)

(Print Name of Surety)

By _____ Surety
(Signature)

(Title of Authorized Officer)

(The Surety Company shall append a single copy of a statement of its financial condition, a copy of the resolution authorizing the execution of Bonds by officers of the Surety Company, Power of Attorney, Surety Acknowledgment.)

AFFIRMATIVE ACTION PROGRAM REQUIREMENT

Affirmative Action Program

An approved Affirmative Action Plan shall be required in all contracts for public work where the awarded contract amount exceeds \$50,000 or more than fourteen (14) persons are employed by the Contractor and/or his subcontractors.

Does the Contractor participate in an approved Affirmative Action Program? Yes [] No []

If Yes, give name of Program: _____

If No, how many employees (total) does the Contractor employ. Please also include in your count the number of employees the Contractor and its Subcontractors expect to use on this project: _____

An approved Affirmative Action Program shall mean a plan approved or adopted by Westchester County including but not limited to, the Home-Town Plan, the Recruitment Training Program or any other program approved or meeting the requirements of the State or Federal government.

The "Monthly Employment Utilization Report" of the Sample Forms, shall be filled out by the Contractor and/or Subcontractor(s) who are required to have an Affirmative Action Program, prior to the start of the work.

Before any subcontractor is approved for use on this contract it will have to complete and submit the "Affirmative Action Program Requirement- Subcontractors" form of the Sample Forms.

COMPLETE THIS FORM USING BLACK INK ONLY

APPRENTICESHIP TRAINING PROGRAM REQUIREMENT

Apprenticeship Training Program

An approved Apprenticeship Training Program shall be required in all contracts for public work where the awarded contract amount exceeds \$50,000. and more than fourteen (14) persons are employed by the Contractor or Subcontractor(s).

Will the Contractor utilize apprentices for this Contract? Yes [] No []

If Contractor Yes, do the apprentices participate in an approved Apprenticeship Training Program? Yes [] No []

If Contractor Yes, give the name of the Program: _____

Will the Subcontractor(s) utilize apprentices for this Contract? Yes [] No []

If Subcontractor(s) Yes, do the apprentices participate in an approved Apprenticeship Training Program? Yes [] No []

If Subcontractor(s) Yes, give the name of the Program: _____

AN APPROVED APPRENTICESHIP TRAINING PROGRAM SHALL MEAN A NEW YORK STATE REGISTERED APPRENTICESHIP TRAINING PROGRAM AS DEFINED UNDER THE NEW YORK STATE LABOR LAW.

COMPLETE THIS FORM USING BLACK INK ONLY

CERTIFICATE OF LICENSE

(TO BE COMPLETED BY AN ELECTRICAL BIDDER ONLY)

_____, being duly sworn
(Name)

deposes and says that the following statements are true:

(1) I am the _____ of the
(Title)

_____, the bidder named on the
(Name of Contractor)

bid proposal, and I have read and am familiar with: a) the electrical license requirements contained in the Information for Bidders of the bid, b) Chapter 277 Article XVII of the Laws of Westchester County entitled Electrical Licensing Board and the Licensing of Master Electricians, and c) the Westchester County Electrical Licensing Board Rules and Regulations.

(2) I am familiar with, and this bid is being submitted in compliance with, the Westchester County Electrical Licensing Board Rules and Regulations, in particular No. 11, which states as follows:

No individual holding a Master Electrician's License shall lend such License to any person or allow any other person to carry on, engage in, or labor at the business as defined herein of installing, removing, altering, testing, replacing, or repairing electrical systems. A violation of this section by any person holding a License shall be sufficient cause for revocation of such License.

However, nothing herein shall be construed to prohibit the use of a License by the holder thereof for or on behalf of a partnership, corporation or other business association, provided that fifty-one (51) percent or more of the control of the voting capital stock of such partnership, corporation, or other business association is owned by one (1) or more holders of a Westchester County Master Electrical License and that all work performed by such partnership, corporation or other business association is performed by or under the direct supervision of such License holder or holders.

(3) That, as of this date, the bidder submitting the bid possesses the applicable valid Master/"Special" Electrician's license issued by the Westchester County Electrical Licensing Board; that this License is being used in compliance with the Laws of Westchester County and Westchester County Electrical Licensing Board Rules and Regulations; and **I have provided a copy of such license with the sealed bid proposal.**

COMPLETE THIS FORM USING BLACK INK ONLY

CERTIFICATE OF LICENSE (Continued)

(TO BE COMPLETED BY AN ELECTRICAL BIDDER ONLY)

(4) That all electrical work shall be performed in accordance with the requirements of Chapter 277 Article XVII of the Laws of Westchester County entitled Electrical Licensing Board and the Licensing of Master Electricians and the Westchester County Electrical Licensing Board Rules and Regulations.

(5) That I make this statement in connection with the submission of the bid as proof of the required electrical license, knowing that this statement will be relied upon by the County in the evaluation of that bid.

Signature

Sworn to before me
this _____ day of _____

License No.

Notary Public - State of New York

COMPLETE THIS FORM USING BLACK INK ONLY

CERTIFICATE OF LICENSE

(TO BE COMPLETED BY A PLUMBING BIDDER ONLY)

_____, being duly sworn
(Name)

deposes and says that the following statements are true:

(1) I am the _____ of the
(Title)

_____, the bidder named on the
(Name of Contractor)

bid proposal, and I have read and am familiar with: a) the plumbing license requirements contained in the Information for Bidders of the bid, b) Chapter 277 Article XV of the Laws of Westchester County entitled Westchester County Board of Plumbing Examiners and County-wide Plumbing License, and c) the Westchester County Board of Plumbing Examiners Rules and Regulations.

(2) I am familiar with, and this bid is being submitted in compliance with, Section 277.509A of Article XV of Chapter 277 of the Laws of Westchester County, which states as follows:

A. No holder of a license or certification issued under this article shall authorize, consent to or permit the use of his or her license or certification by or on behalf of any other person. No person who has not qualified or obtained a license or certification under this article shall represent himself or herself to the public as holder of a license or certification issued under this article, either directly, by means of signs, sign cards metal plates or stationery, or indirectly in any other manner whatsoever. However, nothing herein shall be construed to prohibit the use of a license by the holder thereof for or on behalf of a partnership, corporation or other business association, provided that 51 percent or more of the control of the voting capital stock of such partnership, corporation or other business association is owned by one or more holders of a Westchester County master plumbing license and that all work performed by such partnership, corporation or other business association is performed by or under the direct supervision of such license holder or holders.

(3) That, as of this date, the bidder submitting the bid possesses a valid Master Plumber's license issued by the Westchester County Board of Plumbing Examiners; that this License is being used in compliance with the Laws of Westchester County and the Westchester County Board of Plumbing Examiners Rules and Regulations; and **I have provided a copy of such license with the sealed bid proposal.**

COMPLETE THIS FORM USING BLACK INK ONLY

CERTIFICATE OF LICENSE (Continued)

(TO BE COMPLETED BY A PLUMBING BIDDER ONLY)

(4) That all plumbing work shall be performed in accordance with the requirements of Chapter 277, Article XV of the Laws of Westchester County entitled Westchester County Board of Plumbing Examiners and County-wide Plumbing License, and the Westchester County Board of Plumbing Examiners Rules and Regulations.

(5) That I make this statement in connection with the submission of the bid as proof of the required plumbing license, knowing that this statement will be relied upon by the County in the evaluation of that bid.

Signature

Sworn to before me
this _____ day of _____

License No.

Notary Public - State of New York

COMPLETE THIS FORM USING BLACK INK ONLY

CERTIFICATE OF LICENSE

(TO BE COMPLETED BY A HAULING BIDDER OR SUBCONTRACTOR ONLY)

_____, being duly sworn
(Name)

deposes and says that the following statements are true:

(1) I am the _____ of the
(Title)

_____, the bidder/subcontractor (circle one)
(Name of Contractor)

named on the foregoing bid proposal, and I have read and am familiar with the hauling license requirements contained in the Information for Bidders of the foregoing bid.

(2) That, as of this date, the bidder submitting the foregoing bid/subcontractor of the bidder submitting the foregoing bid (circle one) possesses a valid _____ license
(License type, i.e. Class "A")

issued by the Westchester County Solid Waste Commission.

(3) That all hauling work shall be performed in accordance with the requirements of Chapter 826-a of the Laws of Westchester County.

(4) That I make this statement in connection with the submission of the foregoing bid as proof of the required hauling license, knowing that this statement will be relied upon by the County in the evaluation of that bid.

Signature

Sworn to before me
this _____ day of _____

License No.

Notary Public - State of New York

COMPLETE THIS FORM USING BLACK INK ONLY

STORMWATER POLLUTION PREVENTION CERTIFICATION

I certify under penalty of law that I understand and agree to comply with the terms and conditions of the Stormwater Pollution Prevention Plan (“SPPP”) for the construction site identified in such SPPP as a condition of authorization to discharge stormwater. I also understand the operator must comply with the terms and conditions of the New York State Pollutant Discharge Elimination System (“SPDES”) general permit for stormwater discharges from construction activities and it is unlawful for any person to contribute to a violation of water quality standards.

Signature

Sworn to before me

This _____ day of _____, 200_.

Notary Public – State of New York, County of _____

My Commission Expires on _____.

This Certification will also have to be signed by your subcontractors. Additional copies of this form can be acquired from the Department of Public Works.

COMPLETE THIS FORM USING BLACK INK ONLY

PREVAILING WAGE RATES AND SUPPLEMENTS

Compliance with the New York State Construction (Article 1, Section 17) and the New York State Labor Law (Section 220)

Is your firm in full compliance with the New York State Labor Law?
(Please check one)

Yes _____ No _____

Are the wage supplements paid into a Federally approved program?
(Please check one)

Yes _____ No _____

If Yes, please indicate which program:

If No, please indicate how the supplements are being paid:

Yes, I have read and understand the terms of this Contract and the laws of this Agreement:

Signature

Date: _____

Notary Public

Date: _____

COMPLETE THIS FORM USING BLACK INK ONLY

MINORITY/WOMEN BUSINESS ENTERPRISE PROGRAM QUESTIONNAIRE
QUESTIONNAIRE REGARDING BUSINESS ENTERPRISES
OWNED AND CONTROLLED BY WOMEN OR PERSONS OF COLOR

As part of the County's program to encourage the meaningful and significant participation of business enterprises owned and controlled by persons of color or women in County contracts, and in furtherance of Section 308.01 of the Laws of Westchester County, completion of this form is required.

A "business enterprise owned and controlled by women or persons of color" means a business enterprise, including a sole proprietorship, limited liability partnership, partnership, limited liability corporation, or corporation, that either:

- 1.) meets the following requirements:
 - a. is at least 51% owned by one or more persons of color or women;
 - b. is an enterprise in which such ownership by persons of color or women is real, substantial and continuing;
 - c. is an enterprise in which such ownership interest by persons of color or women has and exercises the authority to control and operate, independently, the day-to-day business decisions of the enterprise; and
 - d. is an enterprise authorized to do business in this state which is independently owned and operated.

- 2.) is a business enterprise certified as a minority business enterprise ("MBE") or women business enterprise ("WBE") pursuant to Article 15-a of the New York State Executive Law and the implementing regulations, 9 New York Code of Rules and Regulations subtitle N Part 540 et seq., **OR**

- 3.) is a business enterprise certified as a small disadvantaged business concern pursuant to the Small Business Act, 15 U.S.C. 631 et seq., and the relevant provisions of the Code of Federal Regulations as amended.

Please note that the term "persons of color," as used in this form, means a United States citizen or permanent resident alien who is and can demonstrate membership of one of the following groups:

- (a) Black persons having origins in any of the Black African racial groups;
- (b) Hispanic persons of Mexican, Puerto Rican, Dominican, Cuban, Central or South American descent of either Indian or Hispanic origin regardless of race;
- (c) Native American or Alaskan native persons having origins in any of the original peoples of North America; or
- (d) Asian or Pacific Islander persons having origins in any of the Far East countries, South East Asia, the Indian subcontinent or the Pacific Islands.

1. Are you a business enterprise owned and controlled by women or persons of color in accordance with the standards listed above?

_____ No

_____ Yes

Please note: If you answered “yes” based upon certification by New York State and/or the Federal government, official documentation of the certification must be attached.

2. If you answered “Yes” above, please check off below whether your business enterprise is owned and controlled by women, persons of color, or both.

_____ Women

_____ Persons of Color (*please check off below all that apply*)

_____ Black persons having origins in any of the Black African racial groups

_____ Hispanic persons of Mexican, Puerto Rican, Dominican, Cuban, Central or South American descent of either Indian or Hispanic origin regardless of race

_____ Native American or Alaskan native persons having origins in any of the original peoples of North America

_____ Asian or Pacific Islander persons having origins in any of the Far East countries, South East Asia, the Indian sub-continent or the Pacific Islands

Name of Business Enterprise: _____

Address: _____

Name and Title of person completing questionnaire: _____

Signature: _____

Notary Public

Date

CONTRACTOR'S DISCLOSURE STATEMENT

Instructions:

The County of Westchester, in order to insure that it employs responsible contractors for its major construction projects, requires all bidders for construction contracts (which includes reconstruction and repair) with an estimated value of One Hundred Thousand (\$100,000.00) or more Dollars to answer completely and swear to the questions below. If a Contractor Disclosure Statement has been included with this bid specification, then the County has determined that it is applicable to this bid. All subcontractors whose contract has a value of One Hundred Thousand (\$100,000.00) or more Dollars must also submit a Contractor Disclosure Statement.

Please read the questions carefully and answer them completely. Before you answer these questions, please read the definitions of terms used in these questions. While you may contact the Department of Public Works if you have questions about this form, the County cannot provide you with any legal advice for which you must contact your own lawyer. **FAILURE TO COMPLETE THIS CONTRACTOR DISCLOSURE STATEMENT IN GOOD FAITH MAY RESULT IN THE REJECTION OF YOUR BID.**

If you have previously filled out a Contractor Disclosure Statement for another County bid and only some but not all of your responses have changed, attach a copy of the prior Contractor Disclosure Statement and check #2 below indicating changes only and only answer those questions which have changed since you last filled out the Contractor Disclosure Statement.

If you have previously completed a Contractor Disclosure Statement for another County bid and nothing has changed in your responses to the questions, then check #3 and fill out the attached No Change Affidavit. Attach a copy of the prior Contractor Disclosure Statement to the No Change Affidavit.

NOTE IF THE SPACES PROVIDED FOR ANSWERS ARE NOT SUFFICIENT FOR YOU TO COMPLETE YOUR ANSWER TO A PARTICULAR QUESTION, THEN ATTACH ADDITIONAL PAGES TO THIS CONTRACTOR DISCLOSURE STATEMENT WHICH INDICATE THE NUMBER OF THE QUESTION THAT YOU ARE COMPLETING THE ANSWER FOR.

ALSO DO NOT LEAVE ANY ANSWERS BLANK. IF A QUESTION IS NOT APPLICABLE, ANSWER - N/A – AND OFFER A BRIEF EXPLANATION AS TO WHY THE QUESTION DOES NOT APPLY.

Definitions:

Affiliate – is another Business Entity in which the Contractor or one or more of the Principals of the Contractor has an ownership interest of more than fifty (50%) percent. An Affiliate is also another Business Entity in which the Parent of the Contractor owns more than fifty (50%) percent of that other Business Entity.

Agency or Government Agency – is any Federal, State, City or other local agency including, but not limited to, departments, offices, quasi-public agencies, public authorities and

CONTRACTOR'S DISCLOSURE STATEMENT

corporations, boards of education and higher education, public development corporations and local development corporations.

Assignee – is a person or Business Entity to whom an assignment (e.g., a transfer to another of any property, real or personal, including a transfer of any rights in such property) is made.

Business Address – is the location of principal executive offices and is also the primary place of business in Westchester County, if different.

Business Entity – is any profit-seeking business including, but not limited to, corporations, limited and general partnerships, joint ventures and individual (sole) proprietorships.

Contract – is any binding agreement with any Government Agency or other Business Entity for the provision of goods, or services including, but not limited to, construction.

Contractor – is the Business Entity submitting this Contractor Disclosure Statement.

Contractor Disclosure Statement – is this document.

Control – A Business Entity controls another Business Entity when:

- The controlling Business Entity owns more than fifty (50%) percent of the controlled Business Entity, or
- The controlling Business Entity directs or has the right to direct daily operations of the controlled Business Entity, or
- The same person is a Principal in both businesses and directs the daily operations of the controlled Business Entity.

Investigations – is any official inquiry by any Government Agency, with the exception of background investigations for employment.

Officer – is any individual who serves in the function of chief executive officer, chief financial officer or chief operating officer of the Business Entity by whatever titles known.

Parent – is a Business Entity which owns more than fifty (50%) percent of another Business Entity.

Principal – is an individual, partnership, joint venture or corporation which holds ten (10%) percent or more ownership interest in the Business Entity.

Partner – shall mean a person or Business Entity that has a joint ownership in a particular business, but the ownership interest is not as a shareholder of a corporation.

Successor – is a person or Business Entity that takes the place that another has left. With reference to a corporation, a successor shall mean another corporation which, through amalgamation, consolidation, or other legal succession, becomes invested with the rights and assumes the burdens of the first corporation.

CONTRACTOR'S DISCLOSURE STATEMENT

CONTRACT NO.: _____

Check if Subcontractor

Type Of Submission

(Put a X or √ next to the applicable type of submission)

1. **Fully Completed Contractor Disclosure Statement** _____
(Sign Oath on last page of Disclosure Statement)

2. **Changes Only Contractor Disclosure Statement** _____
(Attach copy of previously filed Contractor Disclosure Statement that you are amending. Denote any changes on the following Contractor Disclosure Statement. Sign Oath on last page of this Disclosure Statement)

3. **No Change** _____
(Fill out "No Change Affidavit" [below] and attach copy of previously filed Contractor Disclosure Statement)

NO CHANGE AFFIDAVIT

I swear that the attached Contractor Disclosure Statement was submitted to the County of Westchester on _____ and was true as signed, and that
(Date)
since the above date nothing has occurred which changes in any way the responses made to the questions contained in the attached Contractor Disclosure Statement.

Submitted by: _____
(Signature)

Name (Print): _____

Title (Print): _____

Sworn to before me this ____ day of _____, 200_

NOTARY PUBLIC

COMPLETE THIS FORM USING BLACK INK ONLY

CONTRACTOR'S DISCLOSURE STATEMENT

Questions:

1. The Business Address and taxpayer identification number of Contractor and primary telephone number for such location.

2. List the Business Addresses and primary telephone numbers for such locations, if different from answer to #1 above, where Contractor has been located over the last five (5) years.

3. List all other names and taxpayer identification numbers under which the Contractor, or the Principals and Officers of Contractor, have conducted business within the prior five (5) years.

4. For any response to #3 above, list any and all Westchester County contracts that were awarded to such "other name" Business Entity.

5. List the type of Business Entity that the Contractor is presently organized as (for example - sole proprietorship, partnership, joint venture or corporation).

COMPLETE THIS FORM USING BLACK INK ONLY

CONTRACTOR'S DISCLOSURE STATEMENT

6. If Contractor is a corporation, list the date that the Contractor was incorporated. Also list the name of the Government Agency and location of said Agency in which a certificate of incorporation, certificate of doing business or equivalent, has been filed and the date of any amendments thereto. If, however, the Contractor is a partnership, list the date that the partnership was formed and the name of the Government Agency and location of said Agency in which a business certificate for partnership or equivalent has been filed.

7. List all the names, current Business Addresses and business telephone numbers of the Principals and Officers of the Contractor. If the Contractor is a partnership, list all partners and their business telephone numbers.

8. List the names, current Business Addresses, telephone numbers and taxpayer identification numbers of all Affiliates of the Contractor.

9. List all the names, Business Addresses and telephone numbers of the Principals and Officers of the Affiliates listed in response to #7 above. If the Affiliate is a partnership, list the Business Addresses and business telephone numbers of all partners.

COMPLETE THIS FORM USING BLACK INK ONLY

CONTRACTOR'S DISCLOSURE STATEMENT

10. Is the Contractor Controlled by another Business Entity? ____ Yes ____ No. If you answered yes, please identify the name, Business Address and telephone number of that Controlling Business Entity and list any contracts that the Controlling Business Entity has had with Westchester County in the past five (5) years?

11. If the Contractor has Control of any other Business Entity that has had a Contract with the County of Westchester in the past five (5) years, please identify the name, Business Address and telephone number of that Controlled Business Entity.

12. List any and all contract sanctions imposed on the Contractor or on a Business Entity listed in response to #3 above that was imposed by a Government Agency during the prior five (5) years, including, but not limited to, all cautions, suspensions, debarments, cancellations of a contract based on business conduct, declarations of default, determinations of ineligibility to bid or whether any proceedings to determine eligibility to bid are pending.

13. List the contract sanction history for the past five (5) years, as defined in #12 above, for any Affiliate of the Contractor.

COMPLETE THIS FORM USING BLACK INK ONLY

CONTRACTOR'S DISCLOSURE STATEMENT

14. If you answered yes to #10 above, list the contract sanction history as defined in #12 above for the Controlling Business Entity during the past five (5) years.

15. List any and all prevailing wage or supplement payment violations; state labor law violations deemed willful and any other federal or state citations, notices, violation orders, pending administrative hearings or proceedings or determinations of a violation of any labor law or regulation regarding the Contractor.

16. List all Investigations of the Contractor, its Principals and Officers or, if a partnership, of the Contractor's Partners. Also list all investigations of Affiliates, their Principals and Officers or, if a partnership, of their Partners.

COMPLETE THIS FORM USING BLACK INK ONLY

CONTRACTOR'S DISCLOSURE STATEMENT

17. Have all Federal and State income tax returns, if required, been filed by Contractor during the last five (5) years? ___Yes ___No If you answered no, please explain why such returns were not filed.

18. Are there any criminal proceedings pending against the Contractor or any Principal or Officer of the Contractor or partner, if Contractor is a partnership? ___Yes ___No If you answered yes, please provide details of the pending criminal proceedings.

19. List the record of all criminal convictions of the Contractor, any Principal or Officer or partner, if Contractor is a partnership, and of any former Principal or Officer, of the Contractor or former partner, if Contractor is a partnership, for any crime related to truthfulness or business conduct and for any felony committed within the prior ten (10) years.

20. List all bankruptcy proceedings that the Contractor or its Affiliates have been the subject of within the past seven (7) years, whether pending or completed.

COMPLETE THIS FORM USING BLACK INK ONLY

CONTRACTOR'S DISCLOSURE STATEMENT

21. Is the Contractor a successor, assignee or Affiliate of a Business Entity that has ever been denied a Contract or deemed ineligible to bid on a Government Agency contract?

___ Yes No ___ If you answered yes, explain below.

OATH

I swear that all of the above answers are true based on my knowledge of the facts, or are believed by me to be true, based upon a review of records containing the facts or based upon information I obtained from someone who has knowledge of the facts; and that I have authority to sign this document; and that the answers given above have not been made in a manner intended to deceive or to defeat the purpose of the Contractor Disclosure Statement, which is to assist the County of Westchester in determining if the Contractor is a responsible bidder.

Submitted by: _____
(Signature)

Name (Print): _____

Title (Print): _____

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

NOTARY PUBLIC

COMPLETE THIS FORM USING BLACK INK ONLY

REQUIRED DISCLOSURE OF RELATIONSHIPS TO COUNTY

(Prior to execution of a contract by the County, a potential County contractor must complete, sign and return this form to the County)

Contract Name and/or ID No.:

(To be filled in by County)

Name of Contractor:

(To be filled in by Contractor)

A potential County contractor must complete this form as part of the proposed County contract.

- 1.) Are any of the employees that the Contractor will use to carry out this contract also a County officer or employee, or the spouse, child, or dependent of a County officer or employee?

Yes _____ No _____

If yes, please provide details (attach extra pages, if necessary): _____

- 2.) Are any of the owners of the Contractor or their spouses a County officer or employee?

Yes _____ No _____

If yes, please provide details (attach extra pages, if necessary): _____

- 3.) Do any County officers or employees have an **interest**¹ in the Contractor or in any approved subcontractor that will be used for this contract?

Yes _____ No _____

If yes, please provide details (attach extra pages, if necessary): _____

By signing below, I hereby certify that I am authorized to complete this form for the Contractor.

Name: _____

Title: _____

Date: _____

¹ "Interest" means a direct or indirect pecuniary or material benefit accruing to a County officer or employee, his/her spouse, child or dependent, whether as the result of a contract with the County or otherwise. For the purpose of this form, a County officer or employee shall be deemed to have an "interest" in the contract of:

- 1.) His/her spouse, children and dependents, except a contract of employment with the County;
- 2.) A firm, partnership or association of which such officer or employee is a member or employee;
- 3.) A corporation of which such officer or employee is an officer, director or employee; and
- 4.) A corporation of which more than five (5) percent of the outstanding capital stock is owned by any of the aforesaid parties.

QUESTIONNAIRE REGARDING BUSINESS ENTERPRISES
OWNED AND CONTROLLED BY
SERVICE-DISABLED VETERANS

The County believes it is a laudable goal to provide business opportunities to veterans who were disabled while serving our country, and wants to encourage the participation in County contracts of certified business enterprises owned and controlled by service-disabled veterans. As part of the County's program to encourage the participation of such business enterprises in County contracts, and in furtherance of Article 17-B of the New York State Executive Law, we request that you answer the questions listed below.

The term "Certified Service-Disabled Veteran-Owned Business" shall mean a business that is a certified service-disabled veteran-owned business enterprise under the New York State Service-Disabled Veteran-Owned Business Act (Article 17-B of the Executive Law).

1. Are you a business enterprise that is owned and controlled by a service-disabled veteran in accordance with the standards listed above?

_____ No
_____ Yes

2. Are you certified with the State of New York as a Certified Service-Disabled Veteran-Owned Business?

_____ No
_____ Yes

3. If you are certified with the State of New York as a Certified Service-Disabled Veteran-Owned Business, please attach a copy of the certification.

Name of Firm/Business Enterprise: _____
Address: _____
Name/Title of Person completing Questionnaire: _____
Signature: _____

STATE OF NEW YORK)
) ss.:
COUNTY OF)

Notary Public

Date:

SCHEDULE "F"
CRIMINAL BACKGROUND DISCLOSURE
INSTRUCTIONS

Pursuant to Executive Order 1-2008, the County is required to maintain a record of criminal background disclosure from all persons providing work or services in connection with any County contract, including leases of County-owned real property and licenses:

- a.) If any of the persons providing work or services to the County in relation to a County contract are not subject to constant monitoring by County staff while performing tasks and/or while such persons are present on County property pursuant to the County contract; and
- b.) If any of the persons providing work or services to the County in relation to a County contract may, in the course of providing those services, have access to sensitive data (for example SSNs and other personal/secure data); facilities (secure facilities and/or communication equipment); and/or vulnerable populations (for example, children, seniors, and the infirm).

In those situations, the persons who must provide a criminal background disclosure ("Persons Subject to Disclosure") include the following:

- a.) Consultants, Contractors, Licensees, Lessees of County-owned real property, their principals, agents, employees, volunteers or any other person acting on behalf of said Contractor, Consultant, Licensee, or Lessee who is at least sixteen (16) years old, including but not limited to Subconsultants, subcontractors, Sublessess, or Sublicensees who are providing services to the County, and
- b.) Any family member or other person, who is at least sixteen (16) years old, residing in the household of a County employee who lives in housing provided by the County located on County property.

Under Executive Order 1-2008, it is the duty of every County Consultant, Contractor, Licensee, or Lessee to inquire of each and every Person Subject to Disclosure and disclose whether they have been convicted of a crime or whether they are subject to pending criminal charges, and to submit this form with that information.¹ Accordingly, you are required to complete the attached Criminal Background Disclosure Form and Certification.

Please note that under no circumstances shall the existence of a language barrier serve as a basis for the waiver of or an exception from the disclosure requirements of Executive Order 1-2008. If translation services are required by the Consultant, Contractor, Licensee, or Lessee to fulfill this obligation, it shall be at the sole cost and expense of the Consultant, Contractor, Licensee, or Lessee.

Please also note that the conviction of a crime(s) and/or being subject to a pending criminal charge(s) will not automatically result in a denial of a person's right to work on a County contract, right to be on County property, or license, but may, if the County determines that the prior conviction(s) or pending criminal charge(s) create an unacceptable risk. However, if a person fails to list or falsifies any part of his/her conviction history or any pending criminal charge(s) for any reason, he/she may be prohibited from working or being on County property without any risk assessment. If it is later determined that a Person Subject to Disclosure failed to disclose a criminal conviction or pending criminal charge for any reason, his/her right to work on a County contract, be on County property, or license may be terminated at any time.

Please further note that, pursuant to Executive Order 1-2008, and subject to the applicable provisions of New York Correction Law §§ 752 and 753, the County has the right to bar a Person Subject to Disclosure from providing work or services to the County or from being on County property if any such person has:

- a.) A conviction of a crime(s);
- b.) A pending criminal proceeding for a crime(s); or
- c.) Refused to answer questions concerning his/her criminal background

¹ For these disclosures, a "crime" or "pending criminal charge" includes all felonies and misdemeanors as defined under the New York State Penal Law or the equivalent under Federal law or the laws of any other State.

Please finally note that any failure by a County Consultant, Contractor, Licensee, or Lessee to comply with the disclosure requirements of Executive Order 1-2008 may be considered by the County to be a material breach and shall be grounds for immediate termination by the County of the related County contract.

Exemptions

Executive Order 1-2008 exempts from the aforementioned disclosure requirements Persons Subject to Disclosure:

- a.) for whom the County has already conducted a background check and issued a security clearance that is in full force and effect; and
- b.) for whom another state or federal agency having appropriate jurisdiction has conducted a security and/or background clearance or has implemented other protocols or criteria for this purpose that apply to the subject matter of a County contract that is in full force and effect.

If you are claiming an exemption for one or more Persons Subject to Disclosure, you must notify the Procuring Officer². The Procuring Officer will then determine whether the Person(s) Subject to Disclosure are actually exempt, and provide written notification of his/her determination. If the Procuring Officer determines that a Person Subject to Disclosure is not exempt, the Procuring Officer will notify you of that determination, and you will have to include disclosures for that person on your Criminal Background Disclosure Form and Certification.

² Procuring Officer” shall mean the head of the department or the individual or individuals authorized by the head(s) of the department(s) undertaking the procurement and with respect to those matters delegated to the Bureau of Purchase and Supply pursuant to Section 161.11(a) of the Laws of Westchester County, the Purchasing Agent.

Subconsultants, Subcontractors, Sublessees, or Sublicensees

Under Executive Order 1-2008, it is your duty to ensure that any and all approved subconsultants, subcontractors, sublessees, or sublicensees complete and submit the attached Criminal Background Disclosure Form and Certification for all of their respective Persons Subject to Disclosure. This must be done before such a subconsultant, subcontractor, sublessees, or sublicensees can be approved to perform work on a contract.

New Persons Subject to Disclosure

Under Executive Order 1-2008, you have a **CONTINUING OBLIGATION** to maintain the accuracy of the Criminal Background Disclosure Form and Certification (and any accompanying documentation) for the duration of this contract, including any amendments or extensions thereto. Accordingly, it is your duty to complete and submit an updated Criminal Background Disclosure Form and Certification whenever there is a new Person Subject to Disclosure for this contract. **NO NEW PERSON SUBJECT TO DISCLOSURE SHALL PERFORM WORK OR SERVICES OR ENTER ONTO COUNTY PREMISES UNTIL THE UPDATED CRIMINAL BACKGROUND DISCLOSURE FORM AND CERTIFICATION IS FILED WITH THE PROCURING OFFICER.** You shall also provide the County with any other updates that may be necessary to comply with the disclosures required by Executive Order 1-2008.

*PLEASE CONTINUE TO THE
Criminal Background Disclosure Form and Certification
BEGINNING ON THE NEXT PAGE*

CONTRACT #:

Name of Consultant, Contractor, Lessee, or Licensee: _____

**CRIMINAL BACKGROUND DISCLOSURE
FORM AND CERTIFICATION**

If this form is being completed by a subconsultant, subcontractor, sublessee, or sublicensee, please consider all references in this form to “consultant, contractor, lessee, or licensee” to mean “subconsultant, subcontractor, sublessee, or sublicensee” and check here: _____

I, _____, certify that I am a principal or a
(Name of Person Signing Below)

representative of the Consultant, Contractor, Lessee, or Licensee and I am authorized to complete and execute this Criminal Background Disclosure Form and Certification. I certify that I have asked each Person Subject to Disclosure the following questions:

- **Have you or your company ever been convicted of a crime (all felonies and misdemeanors as defined under the New York State Penal Law or the equivalent under Federal law or the laws of any other State) including, but not limited to, conviction for commission of fraud, embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements or receiving stolen property?**
- **Are you or your company subject to any pending criminal charges (all felonies and misdemeanors as defined under the New York State Penal Law or the equivalent under Federal law or the laws of any other State)?**

I certify that the names and titles of Persons Subject to Disclosure who refused to answer **either** of the questions above are:

1. _____
2. _____
3. _____
4. _____
5. _____

(If more space is needed, please attach separate pages labeled “REFUSED to Answer - Continued.”)

I certify that the names and titles of Persons Subject to Disclosure who answered “Yes” to **either of the** questions above are:

1. _____
2. _____
3. _____
4. _____
5. _____

(If more space is needed, please attach separate pages labeled “YES Answers - Continued.”)

Each Person Subject to Disclosure listed above who has either **been convicted of a crime(s)** and/or **is subject to a pending criminal charge(s)** must answer additional questions. Those questions are below.

A Person Subject to Disclosure who has **been convicted of a crime(s)** must respond to the following (please attach separate pages with responses for each person, with their name and title):

- 1.) Describe the reason for being on County property if applicable, identify the specific duties and responsibilities on this project which you intend to perform for the County, including but not limited to, access to sensitive data and facilities and access to vulnerable populations.
- 2.) Please list all criminal convictions along with a brief description of the crime(s) (including all felonies and misdemeanors as defined under the New York State Penal Law or the equivalent under Federal law or the laws of any other State).
- 3.) Please provide the date and place of each conviction.
- 4.) Please provide your age at the time of each crime for which you were convicted.
- 5.) Please provide the legal disposition of each case.
- 6.) Please provide any information either produced by yourself or someone on your behalf in regards to your rehabilitation and good conduct.

A Person Subject to Disclosure who **is subject to a pending criminal charge(s)** must respond to the following (please attach separate pages with responses for each person, with their name and title):

- 1.) Describe the reason for being on County property and if applicable, identify the specific duties and responsibilities on this project which you intend to perform for the County, including but not limited to, access to sensitive data and facilities and access to vulnerable populations.
- 2.) Please identify all pending criminal charges (all felonies and misdemeanors as defined under the New York State Penal Law or the equivalent under Federal law or the laws of any other State).
- 3.) Please briefly describe the nature of the pending charges and the date upon which it is alleged that a crime was committed.

I hereby certify that all of the information provided herein (and in any and all attachments) is true and accurate and that all disclosures required by Executive Order 1-2008 and this Criminal Background Disclosure Form and Certification have been completed. By my signature below, I hereby affirm that all of the facts, statements and answers contained herein (and in any and all attachments) are true and correct. I understand that providing false or incomplete information or withholding by omission or intention pertinent information will be cause for refusing further consideration of my being utilized under this contract.

It is understood and agreed that no Person Subject to Disclosure shall perform work or services or enter onto County property until this required Criminal Background Disclosure Form and Certification is filed with the Procuring Officer.

It is understood and agreed that to the extent that new Persons Subject to Disclosure are proposed to perform work or provide services under this contract after filing of this Criminal Background Disclosure Form and Certification with the Procuring Officer, such new Persons Subject to Disclosure shall not perform work or provide services or enter into County property until an updated Criminal Background Disclosure Form and Certification has been filed with the Procuring Officer.

It is further understood and agreed that the consultant, contractor, lessee, or licensee has a continuing obligation to maintain the accuracy of the Criminal Background Disclosure Form and Certification for the duration of this contract, including any amendments or extensions thereto, and shall provide any updates to the information to the County as necessary to comply with the requirements of Executive Order 1-2008.

Name: _____

Title: _____

Date: _____

Notary Public

Date

SUBCONTRACTOR'S SEALED BID SUBMISSION

Westchester County Contract No.: _____

Name of Subcontractor: _____

Address: _____

Phone #: _____ Fax #: _____

E-mail address: _____

Name of Contractor to whom
this bid is submitted: _____

Scope of Work to be performed by Subcontractor (e.g., electrical, plumbing, HVAC):

The price agreed upon by and between Contractor and Subcontractor for the full
performance of the Subcontractor's work:

\$: _____

In words (e.g, one hundred thousand dollars and xx/100):

Subcontractor

Contractor

Signature

Signature

By _____
(print name & title)

By _____
(print name & title)

**THE SUCCESSFUL LOW BIDDER, BEFORE AWARD OF THE CONTRACT, MUST
PROCURE AND PROVIDE TO THE COUNTY, FROM EACH OF THE ABOVE
DENOTED SUBCONTRACTORS, A CONTRACT DISCLOSURE STATEMENT
(PROPOSAL PAGES 24-32) AND THE REQUIRED DISCLOSURE OF
RELATIONSHIPS TO COUNTY (PROPOSAL PAGES 33-34)**

COMPLETE THIS FORM USING BLACK INK ONLY

INFORMATION FOR BIDDERS



2. INFORMATION FOR BIDDERS

DEPARTMENT OF PUBLIC WORKS

Division of Engineering

INFORMATION FOR BIDDERS

1. ADDENDA AND INTERPRETATION

No interpretation of the meaning of the plans, specifications or other contract documents will be made to any bidder orally. Every request for such interpretation should be in writing addressed to the Westchester County Department of Public Works, Division of Engineering, Room 512, Michaelian Office Building, White Plains, New York, and to be given consideration must be received at least five (5) days prior to the date fixed for the opening of bids. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, if issued, will be posted on the internet not later than three (3) days prior to the date fixed for the opening of bids. Revisions to plans or drawings requiring the issuance of additional or revised drawings will be noted on the internet with instructions how to acquire copies of such revised plans or drawings. Failure of any bidder to receive any such addendum or interpretation or any other form, instrument or document shall not relieve any bidder from any obligation under its bid as submitted. All addenda so issued shall become part of the contract documents.

A bidder's failure to request a clarification, interpretation, etc. of any portion of the plans, specifications, or contract or to point out any inconsistency therein will preclude such bidder from thereafter claiming any ambiguity, inconsistency, or error which should have been discovered by a reasonably prudent bidder and from asserting any claim for damages arising directly or indirectly therefrom.

2. VOIDED CLAUSES

Wherever in this booklet any page is stamped "VOID", only the section(s) or paragraph(s) so stamped are void. All other sections(s) and paragraph(s) remain in full force and effect.

3. PRE-BID SITE INSPECTION

Unless otherwise stated, on building construction work, bidders are free and encouraged to examine the work site during normal work hours preceding the date on which bids are to be opened. For those bidders requesting further clarification of the conditions, an appointment with the County's representative, on the eighth day (Tuesday) prior to the bid opening date, can be requested, by contacting the, Department of Public Works, Division of Engineering at (914) 995-2553.

Each bidder must inform itself fully of the conditions relating to the work to be performed. Failure to do so will not relieve a successful bidder of the obligation to furnish all material and labor necessary to carry out the provisions of the contract documents and to complete the contemplated work for the consideration set forth in its Bid.

At the time of the opening of bids each bidder will be presumed to have inspected the sites and to have read and to be thoroughly familiar with the Plans and Contract Documents (including all addenda).

4. BID SECURITY

Bid Security shall be provided in accordance with the "Notice to Contractors." Where

INFORMATION FOR BIDDERS

a Performance and Payment bond is required in the Notice to Contractors, the executed “Bid Bond and Consent of Surety” of the Proposal Pages must be submitted with the Bid when the bid is more than \$100,000. The successful bidder, no matter the size of its bid, will be required to furnish a Performance and Payment Bond.

Where a Performance and Payment Bond is not specified in the Notice to Contractors, then the required Security may be furnished in the form of a Certified Check; drawn to the order of “County of Westchester, clipped to the top of the front cover and submitted with the Bid.

Certified checks submitted will be returned to all bidders submitting certified checks within three (3) days after the opening of bids unless the bidder or bidders submitting certified checks are among the two lowest bidders. At any time after the opening of bids, the second lowest bidder, if the second lowest bidder has submitted a certified check, may substitute a bid bond for the certified check by presenting the bond to the Secretary of the Board of Acquisition and Contract. This bond shall be in the form and coverage required by the County and shall be in an amount not less than the amount of the bidder's certified check. After receipt, approval and acceptance of the bond by the County, the County will forward to the bidder a County check in an amount equal to the bidder's certified check.

All certified checks submitted will be returned to the two lowest bidders within 48 hours after the successful bidder executes the required contract and furnishes the County with all necessary bonds and insurance certificates.

In the event that the successful bidder has not executed the required contract and furnished the required bonds and insurance certificates within forty-five (45) days after the opening of bids, the County, upon demand from a bidder (except for the successful bidder), will send a County check to the bidder in the amount of the bidder's certified check.

Failure of the successful bidder to execute the contract and furnish the necessary bonds and insurance certificates shall result in forfeiture of the bid security, such sum to be retained by the County as liquidated damages.

5. PERFORMANCE AND PAYMENT BOND

If required pursuant to "Notice to Contractors."

If a Performance and Payment bond is required in accordance with the “Notice to Contractors”, the “Bid Bond and Consent of Surety” of the Proposal Pages must be executed by the Contractor’s Surety Company and submitted with the Bid for all bids over \$100,000.

Simultaneously with its delivery of the executed contract, the successful bidder shall deliver to the County an executed bond in the amount of one hundred percent of the accepted bid as security for the faithful performance of its contract and in the amount of one hundred percent for the payment of all persons performing labor or furnishing materials in connection therewith, prepared in satisfactory form and having as surety thereon such bond underwriter or surety that appears on the U.S. Treasury’s listing of approved sureties (Department Circular 570), and is licensed to transact business in New York State. In the event such Surety ceases to appear on the U.S. Treasury’s listing of approved sureties (Department Circular 570) or ceases to be licensed to transact business in New York State or becomes insolvent or enters liquidation proceedings, the Contractor, at its sole cost, shall furnish a replacement bond from a surety satisfactory to the County.

INFORMATION FOR BIDDERS

The form of contract and Performance and Payment Bond to be used in connection with this Contract and to become a part of the contract documents is attached in the section entitled "Sample Contract and Bond for Construction".

6. INDEMNIFICATION AGREEMENT

The Contractor agrees:

- A. that except for the amount, if any, of damage contributed to, caused by or resulting from the negligence of the County, the Contractor agrees to indemnify and hold harmless the County of Westchester, its officers, employees, elected officials, and agents from and against any and all liability, damage, claims, demands, costs, judgments, fees, attorneys' fees or loss arising directly or indirectly out of the performance or failure to perform hereunder by the Contractor or third parties under the direction or control of the Contractor; and
- B. to provide defense for and defend, at its sole expense, any and all claims, demands or causes of action directly or indirectly arising out of the Agreement and to bear all other costs and expenses related thereto.

7. INSURANCE REQUIREMENTS

The Contractor, upon award of the contract and throughout the term of the Agreement, shall obtain at its own cost and expense the required insurance as delineated below from insurance companies licensed in the State of New York, carrying a Best's financial rating of A or better. Contractor shall provide evidence of such insurance to the County of Westchester ("County"), either by providing a copy of policies and/or certificates as may be required and approved by the Director of Risk Management of the County ("Director"). The policies or certificates thereof shall provide that ten (10) days prior to cancellation or material change in the policy, notices of same shall be given to the Board of Acquisition and Contract of the County of Westchester by registered mail, return receipt requested, for all of the following stated insurance policies, with a copy also sent to the Director of Risk Management of the County. All notices shall name the Contractor and identify the Contract Number.

If at any time any of the policies required herein shall be or become unsatisfactory to the Director, as to form or substance, or if a company issuing any such policy shall be or become unsatisfactory to the Director, the Contractor shall upon notice to that effect from the County, promptly obtain a new policy, and submit the policy or the certificate as requested by the Director to the Office of Risk Management of the County for approval by the Director. Upon failure of the Contractor to furnish, deliver and maintain such insurance, the Agreement, at the election of the County, may be declared suspended, discontinued or terminated.

Failure of the Contractor to take out, maintain, or the taking out or maintenance of any required insurance, shall not relieve the Contractor from any liability under the Agreement, nor shall the insurance requirements be construed to conflict with or otherwise limit the contractual obligations of the Contractor concerning indemnification.

All property losses shall be made payable to the "County of Westchester" and adjusted with the appropriate County personnel.

In the event that claims, for which the County may be liable, in excess of the insured amounts provided herein are filed by reason of Contractor's negligent acts or omissions under the

INFORMATION FOR BIDDERS

agreement or by virtue of the provisions of the labor law or other statute or any other reason, the amount of excess of such claims or any portion thereof, may be withheld from payment due or to become due the Contractor until such time as the Contractor shall furnish such additional security covering such claims in form satisfactory to the Director.

In the event of any loss, if the Contractor maintains broader coverage and/or higher limits than the minimums identified herein, the County shall be entitled to the broader coverage and/or higher limits maintained by the Contractor. Any available insurance proceeds in excess of the specified minimum limits of insurance and coverage shall be available to the County.

The Contractor shall provide proof of the following coverage. (Other coverage may be required by the County of Westchester based on specific needs. If such other coverages are required for a specific contract, those coverages will be described in the "Special Clauses" of the contract specifications):

- a) Workers' Compensation and Employer's Liability. Certificate form C-105.2 or State Fund Insurance Company form U-26.3 is required for proof of compliance with the New York State Workers' Compensation Law. State Workers' Compensation Board form DB-120.1 is required for proof of compliance with the New York State Disability Benefits Law. Location of operation shall be "All locations in Westchester County, New York."

Where an applicant claims to not be required to carry either a Workers' Compensation Policy or Disability Benefits Policy, or both, the employer must complete NYS form CE-200, available to download at: <http://www.wcb.ny.gov>.

If the employer is self-insured for Workers' Compensation, he/she should present a certificate from the New York State Worker's Compensation Board evidencing that fact (Either SI-12, Certificate of Workers' Compensation Self-Insurance, or GSI-105.2, Certificate of Participation in Workers' Compensation Group Self-Insurance).

- b) Commercial General Liability Insurance with a combined single limit of \$1,000,000 (c.s.1) per occurrence and a \$2,000,000 aggregate limit naming the "County of Westchester" as an additional insured on a primary and non-contributory basis. This insurance shall include the following coverages:
 - i. Premises - Operations.
 - ii. Broad Form Contractual.
 - iii. Independent Contractor and Sub-Contractor.
 - iv. Products and Completed Operations.

NOTE: Additional insured status shall be provided by standard or other endorsement that extends coverage to the County of Westchester for both on-going and completed operations.

All Contracts involving the use of explosives, demolition and/or underground work shall provide proof that XCU is covered.

- c) Commercial Umbrella/Excess Insurance: \$2,000,000 each Occurrence and Aggregate naming the "County of Westchester" as additional insured, written on a "follow the form" basis.
- d) Owners Protective Liability Policy naming the County as insured, with a minimum limit of liability per occurrence of \$3,000,000 (where applicable, or as determined by the Director, Risk Management)
- e) Automobile Liability Insurance with a minimum limit of liability per occurrence of \$1,000,000 for bodily injury and a minimum limit of \$100,000 per occurrence for property damage or a

INFORMATION FOR BIDDERS

combined single limit of \$1,000,000 unless otherwise indicated in the contract specifications. This insurance shall include for bodily injury and property damage the following coverages and name the "County of Westchester" as additional insured:

- i. Owned automobiles.
 - ii. Hired automobiles.
 - iii. Non-owned automobiles.
- f) Construction Insurance: For the construction, renovation or repair of bridges, viaducts or similar structures, the Contractor at its own cost and expense shall provide and maintain a "Bridge Builder's Risk Form, All Risk Insurance Contract," with flat premium endorsement, until the construction contract is accepted by the Board of Acquisition and Contract of the County of Westchester. The coverage shall be written for 100% of the completed value, covering the Contractor and County of Westchester as the insureds. The Contractor shall provide the original and duplicate policy to the County (unless the County shall accept, in lieu thereof, all contained endorsements including all applicable provisions and coverages).

For the construction of (a) new buildings and (b) for additions or repairs of existing buildings or structures, the Contractor at its own cost and expense shall provide and maintain a "Builder's Risk Form, All Risk Insurance Contract," with flat premium endorsement, until the construction contract is accepted by the Board of Acquisition and Contract of the County of Westchester. The coverage shall be written for 100% of the completed value, covering the Contractor and County of Westchester as the insureds. The Contractor shall provide the original and duplicate policy to the County (unless the County shall accept, in lieu thereof, all contained endorsements including all applicable provisions and coverages).

- g) With regard to the insurance coverage provided for in Section 7, subsections b), c) and e) above, in addition to naming the "County of Westchester" as an additional insured, the Contractor shall also name "Standard Amusements LLC" as an additional insured with regard to any contract, work or project to be performed at Playland Park in Rye, New York, on the same terms and conditions as provided for the benefit of the County of Westchester.

All policies of the Contractor shall be endorsed to contain the following clauses:

(a) Insurers shall have no right to recovery or subrogation against the County (including its employees and other agents and agencies), it being the intention of the parties that the insurance policies so effected shall protect both parties and be primary coverage for any and all losses covered by the above-described insurance.

(b) The clause "other insurance provisions" in a policy in which the County is named as an insured, shall not apply to the County.

(c) The insurance companies issuing the policy or policies shall have no recourse against the County (including its agents and agencies as aforesaid) for payment of any premiums or for assessments under any form of policy.

(d) Any and all deductibles in the above described insurance policies shall be assumed by and be for the account of, and at the sole risk of, the Contractor.

INFORMATION FOR BIDDERS

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8. PREVAILING WAGE RATES AND SUPPLEMENTS

A. Wages to be Paid and Supplements to be Provided

Each laborer, workman or mechanic employed by the Contractor(s), Sub-contractor(s) or other person(s) doing or contracting to do the whole or part of the work contemplated by this Contract, shall be paid the prevailing wages and provide the supplements (including but not limited to health, welfare and pension benefits) as required by Article 8 (Section 220-223) and Article 9 (230-239) of the New York State Labor Law.

INFORMATION FOR BIDDERS

B. Schedule of Hourly Rates/Supplements

The "Schedule of Hourly Rates and Supplements" shows the prevailing hourly rates of wages to be paid and supplements to be provided. It is the County's preference that such supplements shall be paid to a Federally qualified Pension, Health and Welfare program and New York State Registered Apprentice Training Program.

Classifications not appearing on the rate sheet can be used only with the consent of the Commissioner of Public Works and then the rate to be paid will be given by the Commissioner of Public Works after advising with the State Department of Labor.

C. Grounds for Cancellation of Contract

In the event of a failure, to pay the prevailing wages and provide the supplements in accordance with the New York State Labor Law, and as described in this Contract, it shall be considered a material breach. For the breach or violation of this provision, without limiting any other rights or remedies to which the County or any individual may be entitled or any civil or criminal penalty for which any violator may be liable, the County shall have the right, in its discretion, to terminate this agreement immediately upon notice. In such event, the Contractor(s), Sub-Contractor(s), et al shall be liable to the County for any additional costs incurred by the County in the completion of the project.

In addition to any other remedies available to the County and irrespective of any applicable penalties pursuant to law, the County may deduct from the amount payable to the Contractor under this contract five hundred (\$500.00) dollars as reimbursement for the costs it incurs in investigating any violation of Section 220 of the Labor Law.

D. Records to be kept on Site

The Contractor(s), Sub-contractor(s), et al. shall certify their payrolls and keep them on site and available, in addition to the following informative records:

- 1) Record of hours worked by each workman, laborer and mechanic on each day;
- 2) Record of days worked each week by each workman, laborer and mechanic;
- 3) Schedule of occupation or occupations at which each workman, laborer and mechanic on the project is employed during each work day and week;
- 4) Schedule of hourly wage rates paid to each workman, laborer and mechanic for each occupation.
- 5) A statement or declaration signed by each workman, laborer and mechanic attesting that they have been provided with a written notice, informing them of the prevailing wage rates and supplements requirement for this contract.

E. Responsibility of the Contractor, Sub-Contractor, et al.

The Contractor(s), Sub-Contractor(s), et al. will display the posters in a conspicuous location at the site and distribute the wallet cards to the employees. These posters and wallet cards will inform the employees that they are entitled to receive the prevailing wages and supplements as determined by the Department of Labor and will list the

INFORMATION FOR BIDDERS

Department of Labor's Public Work field offices, with phone numbers for individuals to call if they believe their rights are being violated.

F. Pay for a Legal Day's Work & Use of Apprentices

The wages to be paid for a legal day's work, as hereinbefore defined, to laborers, workmen or mechanics upon such public works, shall be not less than the prevailing rate of wages as hereinafter defined. Serving laborers, helpers, assistants and apprentices shall not be classified as common labor and shall be paid not less than the prevailing rate of wages as hereinafter defined. No employee shall be deemed to be an apprentice unless he is individually registered in an apprenticeship program which is duly registered with the Industrial Commissioner in conformity with the provision of Article 23 of the Labor Law. The wages to be paid for a legal day's work, as hereinbefore defined, to laborers, workmen or mechanics upon any material to be used upon or in connection therewith shall be not less than the prevailing rate for a day's work in the same trade or occupation in the locality within the state where such public work on, about or in connection with which such labor is performed in its final or completed form is to be situated, erected or used and shall be paid in cash; provided, however, that an employer may pay his employees by check upon a Certificate of the Industrial Commissioner to be issued only after a hearing upon the application to pay by check, which hearing shall be with notice of at least five days to be served personally or by mail on all interested persons, or if not served as aforesaid, then to be published in a manner directed by the Industrial Commissioner, which shall afford interested persons the opportunity to appear and to be heard at such hearing, and after proof has been furnished satisfactorily to the Industrial Commissioner of the employer's financial responsibility and the employer gives assurance that such checks may be cashed by employees without difficulty and for the full amount for which they are drawn. Such Contracts shall contain a provision that each laborer, workman or mechanic, employed by such Contractor, Subcontractor or other person about or upon such public works, shall be paid the wages herein provided.

G. Fiscal Officer's Duty to Determine Schedule of Wages

It shall be the duty of the fiscal officer (the "New York State Commissioner of Labor"), to ascertain and determine the schedule of wages to be paid workmen, laborers and mechanics on each such public work, prior to the time of the advertisement for bids, and such schedule of wages shall be annexed to and form a part of the specifications for the work. Such fiscal officer shall file with the department having jurisdiction such schedule of wages to the time of the commencement of the advertisement for bids on all public works proposed to be constructed. The term "Contract" as used in this subdivision also shall include reconstruction and repair of any such public work.

Where Contracts are not awarded within ninety days of the date of the establishment of the prevailing rate of wages by the fiscal officer, the department of jurisdiction shall request of the fiscal officer a redetermination of a schedule of wages.

H. Penalty for Payment of Less than Prevailing Wages

Any person or corporation that willfully pays after entering into such Contract, less than such stipulated wage scale as established by the fiscal officer shall be guilty of a

INFORMATION FOR BIDDERS

misdemeanor and upon conviction shall be punished for such first offense by a fine of five hundred dollars or by imprisonment for not more than thirty days, or both fine and imprisonment; for a second offense by a fine of one thousand dollars, and in addition thereto the Contract on which the violation has occurred shall be forfeited and no such person or corporation shall be entitled to receive any sum nor shall any officer, agent, or employee of the state, municipal corporation or commission or board appointed pursuant to law pay the same or authorize its payment from the funds under his charge or control to any person or corporation for work done upon any Contract, on which the Contractor has been convicted for a second offense in violation of the provisions of this section.

9. LABOR AND COMPLIANCE WITH LABOR LAW

A. Preference for Westchester Residents

The Contractor agrees that in the performance of the work under this Contract he will give preference, and so far as legally possible, to employ citizens and residents of Westchester County.

B. Certifications To Be Filed

It is agreed that, in accordance with Section 220-d of the Labor Law as amended before final payment by or on behalf of the County for any sum due on account of a Contract for a public improvement, the Contractor and each and every Subcontractor of the Contractor or a Subcontractor is required to file a statement in writing in form satisfactory to the Commissioner of Finance certifying to the amounts then due and owing from such Contractor or Subcontractor filing such statement to or on behalf of any and all laborers for daily or weekly wages or supplements on account of labor performed upon the work under the Contract, setting forth therein the names of the persons whose wages or supplements are unpaid and the amount due to each or on behalf of each respectively, which statement so to be filed shall be verified by the oath of the Contractor or Subcontractor as the case may be that he has read such statement subscribed by him and knows the contents thereof, and that the same is true to his own knowledge.

C. Retention of Funds

It is further agreed that in accordance with Section 220b of the Labor Law, as amended:

- 1) In case any interested person shall have previously filed a protest in writing objecting to the payment to any Contractor or Subcontractor to the extent of the amount or amounts due or become due to him/her for daily or weekly wages or supplements for labor performed on the public improvement for which such Contract was entered into, or if for any other reason it may be deemed advisable, the Commissioner of Finance may deduct from the whole amount of any payment on account thereof the sum or sums admitted by any Contractor or Subcontractor in such statement or statements so filed to be due and owing by him on account of labor performed on such public improvement before making payment of the amount certified for payment in any estimate or voucher, and may withhold the amount so deducted for the benefit of the laborers, workmen or mechanics whose

INFORMATION FOR BIDDERS

wages or supplements are unpaid or not provided, as the case may be, as shown by the verified statements filed by any Contractor or Subcontractor, and may pay directly to any person the amount or amounts shown to be due to him or his duly authorized collective bargaining labor organization, as the case may be, for such wages or supplements by the statements filed as hereinbefore required, thereby discharging the obligation of the Contractor or Subcontractor to the person or his duly authorized collective bargaining labor organization receiving such payment to the extent of the amount thereof, or

- 2) When any interested person shall file a written complaint with the fiscal officer as defined in section 220-b of the Labor Law, alleging unpaid wages or supplements due for labor performed on a public improvement for which a Contract has been entered into, and said labor is alleged to have been performed within the two year period immediately preceding the date of the filing of said complaint, or if, on the fiscal officer's own initiative, unpaid wages or supplements appear to be due, the fiscal officer shall immediately so notify the financial officer of the civil division interested, or, if there are insufficient moneys still due to the Contractor or Subcontractor to satisfy said wages and supplements, including interest and penalty, the financial officer of another civil division which has entered or subsequently enters into a public improvement contract with the Contractor or Subcontractor, who shall withhold from any payment due or earned by the Contractor or Subcontractor executing said public improvement, sufficient moneys to satisfy said wages and supplements, including interest at the rate provided herein, and any civil penalty that may be assessed as provided herein, pending a final determination. The Commissioner of Finance shall immediately confirm in writing to the fiscal officer the amount of money withheld.
- 3) Moneys withheld pursuant to this section shall be held by the Commissioner of Finance for the sole and exclusive benefit of the workers employed on said public improvement and for payment of any civil penalty that may be assessed as provided herein and shall not be used for any other purpose except upon court order. Any person, partnership, association, corporation or governmental body who files a lien or commences a judicial proceeding with respect to any moneys withheld pursuant to this section shall notify the fiscal officer in writing of the lien or claim on or before the date of filing of the lien or commencement of the judicial proceeding. In any proceeding to obtain moneys withheld pursuant to this section by any person, partnership, association, corporation or governmental body, the Commissioner of Labor shall have the right to appear and be heard.
- 4) The fiscal officer shall then cause an investigation to be made to determine whether any amounts are due to the laborers, workmen or mechanics, or on their respective behalves, on such public improvement, for labor performed after the commencement of the three-year period immediately preceding the filing of the complaint or the commencement of the investigation on his own initiative, as the case may be, and shall order a hearing therein at a time and place to be specified and shall give notice thereof, together with a copy of such complaint, or a statement of the facts disclosed upon such investigation, which notice shall be served personally or by mail on all interested persons, including the person complained

INFORMATION FOR BIDDERS

against and upon the financial officer of the civil division; such person complained against shall have an opportunity to be heard in respect to the matters complained of, at the time and place specified in such notice, which time shall be not less than five days from the service of said notice. The fiscal officer in such an investigation shall be deemed to be acting in a judicial capacity and shall have the rights to issue subpoenas, administer oaths and examine witnesses. The enforcement of a subpoena issued under this section shall be regulated by the Civil Practice Law and Rules. Such investigation and hearing shall be expeditiously conducted, and upon such hearing and investigation, the fiscal officer shall determine the issues raised thereon and shall make and file an order in his office stating such determination and forthwith serve a copy of such order, either personally or by mail, together with notice of filing, upon the parties to such proceedings, and if the fiscal officer be the Comptroller, upon the Commissioner of the Department of Labor. Such order shall direct payment of wages or supplements found to be due, including interest at the rate of interest then in effect as prescribed by the Superintendent of Banks pursuant to Section fourteen (a) of the Banking law per annum from the date of the underpayment to the date of payment.

- 5) In addition to directing payment of wages or supplements, including interest found to be due, the order of the fiscal officer may direct payment of a further sum as a civil penalty in an amount not exceeding twenty-five percent of the total amount found to be due. In assessing the amount of the penalty, due consideration shall be given to the size of the employer's business, the good faith of the employer, the gravity of the violation, the history of previous violations of the employer or any successor or substantially-owned affiliated entity or any of the partners if the Contractor or Subcontractor is a partnership or any of the five largest shareholders of the Contractor or Subcontractor, as determined by the fiscal officer, and any officer of the Contractor or Subcontractor who knowingly participated in the violation of this article, and the failure to comply with record keeping or other non-wage requirements. Upon the fiscal officer's determination of the penalty, where the fiscal officer is the Commissioner of the Department of Labor, the penalty shall be paid to said Commissioner for deposit in the State Treasury.
- 6) Upon the entry and service of such order, the Commissioner of Finance shall pay to the claimant, from the moneys due to the Contractor or Subcontractor, the amount of the claim as determined by the fiscal officer and the amount of the civil penalty, if any, shall be paid as provided herein, provided that no proceeding pursuant to Article Seventy-Eight of the Civil Practice Law and Rules for review of said order is commenced by any party aggrieved thereby within thirty days from the date of said order was filed in the office of the fiscal officer. Said proceeding shall be directly in the appellate division of the Supreme Court. Where the fiscal officer is the Commissioner of the Department of Labor, the civil penalty shall be paid to said Commissioner for deposit in the State Treasury. In the event that such a proceeding for review is instituted, moneys sufficient to satisfy the claim and civil penalty shall be set aside by the Commissioner of Finance, subject to the order of the Court.

INFORMATION FOR BIDDERS

- 7) When final determination has been made and such determination is in favor of the complainant, said complainant may in addition to any other remedy provided by this article, institute an action in any Court of appropriate jurisdiction against the person or corporation found violating this article, any substantially-owned affiliated entity or any successor of the Contractor or Subcontractor, any officer of the Contractor or Subcontractor who knowingly participated in the violation of this article, and any of the partners if the Contractor or Subcontractor is a partnership or any of the five largest shareholders of the Contractor or Subcontractor, as determined by the fiscal officer, for the recovery of the difference between the sum, if any, actually paid to him by the Commissioner of Finance pursuant to said order and the amount found to be due him as determined by said order. Such action must be commenced, within three years from the date of the filing of said order, or if the said order is reviewed in a proceeding pursuant to Article Seventy-eight of the Civil Practice Law and Rules, within three years after the termination of such review proceeding.

- 8) When two final determinations have been rendered against a Contractor, Subcontractor, successor, or any substantially owned affiliated entity of the Contractor or Subcontractor, any of the partners if the Contractor or Subcontractor is a partnership, any officer of the Contractor or Subcontractor who knowingly participated in the violation of this article, any of the five largest shareholders of the Contractor or Subcontractor or any successor within any consecutive six-year period determining that such Contractor, Subcontractor, successor, or any substantially-owned affiliated entity of the Contractor or Subcontractor, any of the partners or any of the five largest shareholders of the Contractor or Subcontractor, any officer of the Contractor or Subcontractor who knowingly participated in the violation of this article has willfully failed to pay the prevailing rate of wages or to provide supplements in accordance with 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, Subcontractor, successor, or any substantially-owned affiliated entity of the Contractor or Subcontractor, any of the partners if the Contractor or Subcontractor is a partnership or any of the five largest shareholders of the Contractor or Subcontractor, any officer of the Contractor or Subcontractor who knowingly participated in the violation of this article shall be ineligible to submit a bid on or be awarded any public work contract or subcontract with the State, any municipal corporation or public body for a period of five years from the second final determination, provided, however, that where any such final determination involves the falsification of payroll records or the kickback of wages or supplements, the Contractor, Subcontractor, successor, or any substantially-owned affiliated entity of the Contractor or Subcontractor, any partner if the Contractor or Subcontractor is a partnership or any of the five largest shareholders of the Contractor or Subcontractor, any officer of the Contractor or Subcontractor who knowingly participated in the violation of this article shall be ineligible to submit a bid on or be awarded any public work contract with the State, any municipal corporation or public body for a period of five years from the first final determination.

INFORMATION FOR BIDDERS

- 9) Nothing in this subdivision shall be construed as affecting any provision of any other law or regulation relating to the awarding of public contracts.

Pursuant to Section 220-C of the Labor law, any Contractor or Subcontractor who shall upon his oath verify any statement required to be filed herein, which is known by him to be false, shall be guilty of perjury and punishable as provided by the Penal Law.

10. CONTRACTOR'S REPORT OF EMPLOYMENT AND WEEKLY AFFIDAVIT

Each week the Contractor shall furnish to the Commissioner of Public Works the "Contractor's Report Of Employment And Weekly Affidavit" of the Sample Forms.

11. LAWS/REGULATIONS AND APPROPRIATIONS

- A. The Contractor shall, at its own cost and expense, comply with all provisions of the Labor Law (i.e. prevailing rate of wages and supplements), Lien Law, Workmen's Compensation Law and all other laws and ordinances affecting this contract or order, either Federal, State or local.
- B. It is recognized and understood by the Parties that when this Agreement is subject to future appropriation by the Westchester County Board of Legislators for funds not presently appropriated to pay for this Agreement; the County shall have no liability under this agreement beyond the funds, if any, that are appropriated and available for payment of the amounts due under this Agreement. The Parties understand and intend that the obligation of the County to pay the amounts due hereunder shall constitute a current expense of the County and shall not in any way be construed to be a debt of the County in contravention of any applicable constitutional or statutory limitations or requirements concerning the creation of indebtedness by the County, nor shall anything contained in this Agreement constitute a pledge of the general tax revenues, funds or monies of the County. The County shall pay amounts due under this Agreement exclusively from legally available funds appropriated for this purpose. Notwithstanding the foregoing, the County will do all things lawfully within its power to obtain, maintain, and properly request and pursue funds from which payments under this Agreement may be made, including: (i) the County Executive making provisions for such payments to the extent necessary in the annual budget submitted to the Board of Legislators for the purpose of obtaining funding; and (ii) using its reasonable efforts to have such portion of the budget approved.

12. REFUSAL TO ANSWER QUESTIONS

It is understood and agreed by the Contractor that he/she bears an affirmative obligation to answer questions specifically or directly relating to this agreement before any official, board or agency authorized or empowered to inquire into such matters. This section shall not be construed as barring the Contractor, its directors, officers or employees from exercising their constitutional privilege against self-incrimination.

The foregoing, however, shall not be construed as limiting the rights and remedies of the County in the event of such refusal, and when such body or agency is wholly civil in nature,

INFORMATION FOR BIDDERS

failure or refusal to fully cooperate with and diligently answer the inquiries of such official, board or agency may constitute grounds for the termination of this agreement and/or the exercise of any and all other rights or remedies which the County may have by reason of such failure or refusal.

Any and all contracts made with the State, the County of Westchester, or any public department, agency or official thereof, since July 1, 1959 by such person and by any firm, partnership or corporation of which he is a member, partner, director or officer, may be canceled or terminated by the County of Westchester, without incurring any penalty or damages on account of such cancellation or termination, but any monies owing pursuant to said transaction or contract prior to the cancellation and termination, shall be paid.

The successful bidder will be required to make all books and records concerning this contract available during business hours, upon reasonable notice, to duly authorized County personnel for the purpose of ascertaining compliance and/or performance of all provisions of this contract. This provision shall survive the termination of this agreement and for a period of six (6) years thereafter.

13. BID REQUIREMENTS

The Bid must be made on the "Proposal Pages" included in this specification or as provided with an addendum. All blank spaces on said Proposal Pages must be filled in and no change shall be made in the phraseology or in the items as contained therein.

Any bid which fails to name a price per unit of measurement for each of the items for which quantities are given, may be held to be informal and rejected. Bids submitted on Proposal Pages that contain any omissions, alterations, additions or items not called for in the bid documents, or that are illegible, unbalanced, conditional, incomplete or contain irregularities of any kind, may be rejected as informal. If the various parts of the work have been divided into classes and/or items to enable the bidder to bid for different portions of the work in accordance with its estimate of their costs, in the event of any increase or decrease in the quantity will be paid for at the price bid for that particular item. The sum of the amounts for each class or item, obtained by multiplying the approximate quantity by the unit price, shall constitute the total sum bid.

In the event of a discrepancy between the written bid amount and the numerical bid amount, the written amount will take precedence and be controlling as to the amount of the Bid. Any such discrepancy shall be corrected as set forth in Article "Correction Of Errors" of the Information for Bidders.

14. MISCELLANEOUS ADDITIONAL WORK (ITEM W-800)

A. Description - Under this item each Contractor shall furnish all labor, material and equipment required to accomplish miscellaneous additional work:

- 1) Necessitated by encountering during the course of the work field conditions of a nature not determinable during design; or
- 2) For which no unit prices are applicable.

INFORMATION FOR BIDDERS

- B. Method of Measurement - Only that miscellaneous additional work shall be performed by the Contractor and will be paid for by the County, which has been authorized by the Commissioner or the Construction Administrator in writing, prior to its commencement.
- C. Article “Increase or Decrease of Quantities: Elimination of Items” of the Information for Bidders, will still apply relative to the percentage of the total awarded contract price that the work under the contract may be increased or decreased.
- D. Payment - The total amount paid to the Contractor will be determined in strict accordance with the provisions of Article “Extra Work: Increased Compensation/ Decreased Work: Credit to the Owner” of the General Clauses, and such payment will include only that overhead and profit that is applicable to the work performed under this item.
- E. Each Contractor shall include in its total bid the lump sum printed in the Proposal and any bid other than the specified amount will be considered informal.

15. CORRECTION OF ERRORS

Relative to dollar bid items and the required computations as submitted and performed by bidders on the proposal sheets, if there are any inconsistencies derived in multiplying unit bid prices by the stated quantities, the Commissioner reserves the right to reconcile the unit bid prices or the products of the unit bid prices and the stated quantities, when in the Commissioner's professional opinion such reconciliation(s) would concur with the apparent intent of a bidder and the Commissioner's estimated values of the respective bid items of the proposed contract work. In addition to the foregoing, the Commissioner reserves the right to correct all mathematical errors in additions or subtractions.

16. SHOWN QUANTITIES

All bids shall be submitted upon the following express conditions, which shall apply to and become a part of every bid received. The Bidders accept the quantities shown on the Proposal Pages opposite items of the work for which unit prices are to be bid as being approximate estimated quantities. Bidders shall satisfy themselves by personal examination of the location of the proposed work and surroundings thereof, and by such other means as they may prefer, as to the scope of the work and the accuracy of the approximate estimated quantities; and shall not at any time after submission of their bids dispute such approximate estimated quantities nor assert that there was any misrepresentation by the County or any misunderstanding by the Contractor in regard to the quantity or kind of materials to be furnished, or work to be done.

17. QUALIFICATION OF BIDDERS

The County may make such investigation as it deems necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish all information and data for this purpose as may be requested. The County reserves the right to reject any bid if the evidence submitted by, or the investigation of such bidder fails to satisfy the County, in the County's sole discretion, that it is properly qualified to carry out the obligations of the contract and to complete the contemplated work.

INFORMATION FOR BIDDERS

18. REQUIRED EXPERIENCE

The County requires that each contractor possess not less than five (5) year's experience in performing work substantially similar in scope and size to the work for which it is bidding. The contractor agrees that upon request of the County the contractor will furnish a detailed statement of each project that it has performed during the most recent five (5) years (including but not limited to the name and address of the project, the name of the awarding entity/owner, the name of the awarding entity's/owner's representative, a current telephone number where that representative can be reached, the description of the project, general scope of the contractor's work, contract price, dates of performance, whether the contract was terminated for cause or convenience, whether the contract was completed and whether liquidated damages were assessed against the contractor [and if so, provide a written explanation]). The County reserves the right to require additional information as it deems appropriate concerning the history of the contractor's performance of each such contract. The final determination of whether the contractor possesses the requisite experience rests in the sole discretion of the County.

19. INCREASE OR DECREASE OF QUANTITIES: ELIMINATION OF ITEMS

In entering into this contract, the Contractor agrees that quantities shown on the Proposal Pages opposite items of the work for which unit prices have been requested are approximate estimated quantities, and that during the progress of the work the County may find it advisable and shall have the right to omit portions of the work, and to increase or decrease the shown approximate estimated quantities, or the scope of the whole work; and that the County reserves the right to add to or take from the total amount of the work up to a limit of thirty percent of the total amount of the contract based upon the executed contract price for all the specified work.

The Contractor shall make no claim for anticipated profits or loss of profits, because of any difference between the quantities of the various classes of work actually done, or of the materials actually furnished, and the original specified scope of work and the shown approximate estimated quantities.

The aforesaid thirty- percent pertains to the total amount of the contract and not to any individual item. Individual items may be increased or decreased any amount or may be eliminated entirely if so ordered by the Commissioner, excepting that the total amount of the contract as adjusted shall not result in a net increase or decrease of more than thirty percent except by mutual agreement between both parties thereto.

The Contractor waives all claims of any nature due to a misunderstanding of the location, character, or other conditions surrounding the work or of the shown approximate estimated quantities of items of the work.

20. BREAKDOWN COST OF LUMP SUM ITEMS AND CONTRACTS

After award of the contract and prior to actual start of the work, the successful bidder shall submit an itemized schedule of its estimated costs of lump sum items and or lump sum total contract work, for approval by the County. The schedule shall be submitted as an outline series with minor subdivisions, in accordance with the directives of the County. As part of

INFORMATION FOR BIDDERS

this Schedule, the Contractor will be required to include a sum sufficient, as determined in the County's sole discretion, for the preparation and submission of approved final "As-builts", record drawings, guarantees, warranties, and operations and maintenance manuals.

21. ENGINEERING CHARGES

In addition to any and all other remedies available to the County when the work embraced in the contract is not completed on or before the date specified herein, engineering and inspection expenses incurred by the County of Westchester upon the work from the completion date originally fixed in the contract to the final date of completion of the work may be charged to the Contractor and be deducted from monies due the Contractor. Consideration of any extra work or supplemental contract work added to the original contract, as well as extenuating circumstances beyond the control of the Contractor, will be given due consideration by the County before assessing engineering and inspection charges against the Contractor. Such charges will be assessed, however, in cases where in the opinion of the Commissioner, the Contractor has delayed the work.

22. ESTIMATES AND PAYMENTS

As the work progresses but not more often than once a month and then on such days as the Construction Administrator may fix, the Contractor will submit a requisition in writing of the amount and value of the work performed and the materials and equipment provided to the date of the requisition, less any amount previously paid to the Contractor. The Contractor must complete at least ten (10%) percent of the work before submitting any claims for mobilization. From each requisition, the County will retain five percent (5%) plus one hundred fifty percent (150%) of the amount necessary to satisfy any claims, liens or judgments against the Contractor that have not been suitably discharged. The Commissioner will thereupon cause the balance of the requisition therein to be paid to the Contractor. In lieu of all or part of the cash retainage the County shall only accept bonds or notes of United States of America, New York State or political subdivisions thereof. As a condition to the making of any progress payment as set forth in this paragraph, the County, in its sole discretion may require the Contractor to submit such document as may be reasonably required to establish that the Contractor (and its subcontractor(s)) have timely and properly paid their respective subcontractor(s) and materialmen of whatever tier.

VENDOR DIRECT PAYMENT: All payments made by the County to the Contractor will be made by electronic funds transfer ("EFT") pursuant to the County's Vendor Direct program. The Contractor is required to complete the Vendor Direct Payment Authorization Form, which is located in the Forms Section on page 11 and 12. Payments will be automatically credited to the Contractor's designated bank account at the Contractor's financial institution. Payments are anticipated to be deposited two business days after the voucher/invoice is processed for payment. Saturdays, Sundays, and legal holidays are not considered business days. Under the Vendor Direct program you will receive an e-mail notification two days prior to the day the payment will be credited to your designated account. The e-mail notification will come in the form of a remittance advice with the same information that currently appears on County check stubs and will contain the date that the funds will be credited to your account. If there is a discrepancy in the amount received please contact

INFORMATION FOR BIDDERS

your Westchester County representative as you would have in the past if there were a discrepancy in a check.

In the unlikely event that you do not receive the money in your designated bank account on the date indicated in the e-mail, please contact the Westchester County Accounts Payable Department at 914-995-3748. Whenever you change your bank or change or close your account a new Vendor Direct Payment Authorization Form must be submitted. Please contact the Westchester County Accounts Payable Department at 914-995-3748 and a new form will be e-mailed to you. When completing the payment authorization form you must either supply a voided check or have it signed by a bank official to ensure the authenticity of the account being set up to receive your payments. Failure to return the completed authorization form prior to award of the contract may result in the bid being considered non-responsive and the bid may be rejected.

When the work or major portion thereof, as contemplated by the terms of the contract (see Substantial Completion Payment and Final Payment later in this article), are substantially completed in the judgment of the Commissioner, the Contractor shall submit a requisition for the remainder of the contract balance. An amount equal to two (2) times the value of the remaining items to be completed plus one hundred fifty percent (150%) of the amount that the Commissioner deems necessary to satisfy to satisfy any claims, liens or judgments against the Contractor which have not been suitably discharged shall be deducted from the requisition. As the remaining items of work are satisfactorily completed or corrected, the County will, upon receipt of a requisition, pay for these items less one hundred fifty percent (150%) of the amount necessary to satisfy any claims, liens or judgments.

Contractor agrees, in the event of any withdrawal by the contractor of amounts retained from payments to the contractor pursuant to the terms hereof, that notwithstanding any contrary interpretation of Section 106 of the New York General Municipal Law, the contractor will be obliged to maintain the market value of securities deposited in an amount equal to the amount withdrawn pursuant to said Section 106. The Contractor will, within five (5) days of demand therefore by the fiscal officer of the County, deposit with such fiscal officer cash, or securities of the kind provided in Section 106, of a market value sufficient to maintain the market value of all securities on deposit at a level equal (as of the date such notice of the fiscal officer is given to the contractor) to the amount which the County shall be entitled to retain from payments to the contractor pursuant to the terms of the contract.

All estimates will be made for actual quantities for work performed and materials and equipment incorporated in the work as determined by the measurements of the Engineer, and this determination shall be accepted as final, conclusive and binding upon the Contractor. All estimates will be subject to correction in any succeeding estimate.

Payment will be made for materials pertinent to the project which have been delivered to the site or off-site by the Contractor and/or Subcontractor and suitably stored and secured in first-class condition as required by the Construction Administrator. Payment may be limited to materials in short and/or critical supply and materials specially fabricated for the project, as defined by the contract. Payment will be made only upon the written request of the contractor. The Contractor must submit certified copies of the manufacturer's or vendor's invoices or statements establishing the true purchase value of the material or equipment; freight bills, release of liens and certificate of insurance covering all equipment and materials. Then the County will include in the following monthly payment an amount not to

INFORMATION FOR BIDDERS

exceed the lesser of the bid breakdown or the total purchase price of the stored equipment and materials less retainage provided that such equipment and materials are suitable for their intended use.

The Contractor shall be responsible for safeguarding stored equipment and materials against loss or damage of any nature whatsoever, shall retain title until incorporated into the work and acceptance by the County and in case of loss or damage, the Contractor shall replace such lost or damaged equipment and materials at no cost to the County.

After receipt of payment, the Contractor shall not remove from the site equipment and materials for which such payment was made without written authorization from the Commissioner.

No major equipment item shall be brought to the site until the following conditions are met:

- 1) The County must have received the manufacture's recommendations for on-site storage in writing.
- 2) The structure in which the equipment is to be installed is roofed (roofing must be watertight) and has such protection of doorways, windows, and other openings that will provide reasonable protection from the weather.
- 3) Prior to the County making a Partial Payment on a major equipment item the following conditions must be met:
 - a. The Contractor must certify to the County, in writing, that the equipment has been properly stored.
 - b. The Shop Drawings must be approved and the draft Operation and Maintenance Manuals must have been submitted.

The Contractor shall furnish to the Construction Administrator, prior to the making up of any Partial or Final Estimate, a copy of its and its Subcontractors' weekly payrolls for each and every preceding payroll period. The payroll submitted shall be a certified true copy and shall contain full information including but not limited to the number of hours worked, rate, classification and total sum paid each employee charged to or working on the job. With all except the first estimate, the Contractor shall furnish to the Construction Administrator a sworn statement listing all unpaid bills and liabilities incurred under the Contract.

A. Substantial Completion Payment

- 1) Within thirty (30) days after receiving written notice from the Contractor of substantial completion of the work under this Agreement, the Commissioner will cause an inspection to be made of the work done under this contract. If, upon such inspection, the Engineer determines that the work is substantially complete, a Substantial Completion Payment to the Contractor for the work done under this Contract, less any and all deductions authorized to be made by the Commissioner under this contract or by law, will be issued.
- 2) Such a Payment shall be considered a Partial and not a Final Payment.
- 3) As a condition precedent to receiving payment therefore, the Contractor must have received County approval of all Shop Drawing submittals, the Operation and Maintenance Manuals, and As-Built Drawing(s). Together with its application for substantial completion payment the Contractor shall also deliver to the

INFORMATION FOR BIDDERS

Construction Administrator a verified statement certifying that all claims or liabilities arising from the completed work, including all charges for Extra Work, Change Orders, additional time, damages or credits (collectively referred to as “claims”) have been presented to the County. All such claims shall be described in sufficient detail so as to be easily identified. The Contractor’s failure to submit the verified statement shall constitute a full and final waiver of all claims against the County from the beginning of the project through the date of substantial completion as established by the County. The presentation of the verified statement to the County shall not constitute an acknowledgement by the County that any such claim is valid. The County expressly reserves its right to assert that any such claim(s) is waived or precluded by reason of other provisions of the contract documents. Only claims particularly identified on the Contractor’s verified statement shall be preserved; all other claims whatever nature shall be deemed waived and released. It shall also submit proof of title of the materials and equipment covered by the contract. The Contractor shall also, prior to the issuance of said Substantial Completion Payment, supply to the County affidavits and certificates for labor, material and equipment (where applicable).

B. Final Payment

- 1) Within ten (10) days after receiving written notice from the Contractor of completion of all the work, the Engineer will make a final inspection. If upon inspection the Engineer determines that no further work is needed, the Commissioner will request that the Board of Acquisition and Contract approve the completion of the project and authorize payment of the Final Estimate. Also required prior to the Board of Acquisition and Contract approval is a Condition Report by the Contractor that any damage of public or privately owned properties resulting from the Contractor’s work has been satisfactorily repaired.
- 2) As a condition precedent to receiving Final Payment therefore the Contractor shall submit a supplementary verified statement similar to that required under, “A. Substantial Completion Payment”, hereof. This verified statement must include only those charges for Extra Work, Change Orders, additional time, damages or credits (collectively referred to as “claims”) that accrued between substantial completion and final completion. The Contractor’s failure to submit the verified statement shall constitute a full and final waiver of all claims against the County from the beginning of the project through the date of substantial completion as established by the County. The presentation of the verified statement to the County shall not constitute an acknowledgement by the County that any such claim is valid. The County expressly reserves its right to assert that any such claim is waived or precluded by reason of other provisions of the contract documents. Only claims particularly identified on the Contractor’s supplementary verified statement shall be preserved; all other claims of whatever nature shall be deemed waived and released.
- 3) The Contractor shall also, prior to the issuance of Final Payment, supply to the County affidavits and certificates for labor, material and equipment (where applicable).

INFORMATION FOR BIDDERS

- 4) The County will, not less than thirty (30) days after the Final Acceptance of the work under this contract, by the Board of Acquisition and Contract, pay the Contractor upon the receipt of all required documentation the balance of funds due thereunder after deduction of all previous payments, liens and all percentages and amounts to be kept and retained under provision of this contract.

All prior Partial Payments, being merely estimates made to enable the Contractor to prosecute the work more advantageously, shall be subject to correction in the Final Estimate and Payment

- 5) The acceptance by the Contractor or by anyone claiming by or through him of the Final Payment shall operate as and shall be a release to the County and every officer and agent thereof, from any and all claims of the Contractor for anything done or furnished in connection with this work or project and for any act or omission of the County or of any others relating to or affecting the work. No payment, however, final or otherwise, shall operate to release the Contractor or its Sureties from any obligation under this contract or the Performance and Payment Bond. Should the Contractor refuse to accept the final payment as tendered by the County, it shall constitute a waiver of any rights to interest thereon. Nor shall refusal to accept final payment extend any applicable statute of limitation.

23. PAYMENTS TO SUBCONTRACTORS AND MATERIALMEN BY CONTRACTOR

Within fifteen calendar days of the receipt of any payment from the County, the contractor shall pay each of its sub-contractors and materialmen the proceeds from the payment representing the value of the work performed and/or materials furnished by the subcontractor and/or materialmen as reflected in the payment from the owner less an amount necessary to satisfy any claims, liens or judgment against the subcontractor or materialman which have not been suitably discharged and less any retained amount as hereafter described. The contractor shall retain not more than five per centum of each payment to the subcontractor and/or materialman except that the contractor may retain in excess of five per centum but not more than ten per centum of each payment to the subcontractor provided that prior to entering into a subcontract with the contractor, the sub-contractor is unable or unwilling to provide a performance bond and a labor and material bond both in the full amount of the sub-contract at the request of the contractor. However, the contractor shall retain nothing from those payments representing proceeds owed the subcontractor and/or materialman from the County's payments to the contractor for the remaining amounts of the contract balance as provided in Article "Estimates and Payments" of the Information For Bidders. Within fifteen calendar days of the receipts of payment from the contractor, the subcontractor and/or materialman shall pay each of its subcontractors and materialmen in the same manner as the contractor has paid the subcontractor.

Nothing provided herein shall create any obligation on the part of the County to pay or to see the payment of any moneys to any subcontractor or materialman from any contractor nor shall anything provided herein serve to create any relationship in contract or otherwise, implied or expressed between the subcontractor or materialman and the County. Notwithstanding anything to the foregoing, the County may tender payments to the Contractor in the form of joint or dual payee checks.

INFORMATION FOR BIDDERS

NOTICE: No direct payment will be made for work done or materials furnished under the General Clauses, Information for Bidders, General Clauses and Special Clauses, except where expressly stated elsewhere, but compensation shall be deemed to be included in the contract lump sum price for the total work and/or the contract unit prices for the various items of the work.

24. TIME OF STARTING

Time being of the essence, all bidders shall take notice that the timely completion of the work called for under this contract is of the greatest importance. The contractor shall commence its work within ten (10) days after "notice to proceed" has been given it by the Commissioner (unless a definite starting date is stated). Prior to commencing its work, the Contractor shall notify the Director of Project Management, Division of Engineering and Department of Public Works, at least forty-eight (48) hours prior to the planned date of its "start", so that a Construction Administrator can be assigned to the work.

25. SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION AND DEMOLITION WORK

At all times the Contractor shall use all required and necessary precautions for the safety and protection of the public, County personnel, construction employees, and private and public property on or adjacent to the work.

The Contractor shall comply fully with all the applicable provisions of the following listed governmental regulations and standards, noting that in case of conflict, the Contractor shall comply with the most stringent rule or regulation:

- 1) State of New York, Department of Labor, Bureau of Standards and Appeals, Industrial Code Rule 23 "Protection of Persons Employed in Construction and Demolition Work."
- 2) United States Department of Labor, Bureau of Labor Standards, "Safety and Health Regulations for Construction," as promulgated in accordance with the Occupational Safety and Health Act of 1970, Public Law 91-596; 84 Stat. 1590, Laws of 91st Congress - 2nd Session.

It shall be the sole responsibility of the Contractor to ascertain which of the regulations and standards contained in the foregoing listed publications effect its construction activities, and it shall be solely responsible for the penalties resulting from its failure to comply with such applicable rules and regulations. Copies of the listed publications are available for reference purposes only, in the Westchester County Department of Public Works, Division of Engineering, Design Section, Room 500, Michaelian Office Building, White Plains, New York.

The West Nile Mosquito control program:

- 1) Routinely, the work site should be inspected for potential habitats (i.e. stagnant/standing water) for mosquitoes.
- 2) Conditions that would require remediation include: improper site grading, ruts/other depressions, water in debris (i.e. containers, tires, etc.), stored or

INFORMATION FOR BIDDERS

discarded materials, and excavations, and those cited by the Construction Administrator.

- 3) Under the direction of the Construction Administrator, the Contractor shall take all necessary preventive and/or corrective action to eliminate the potential breeding grounds.

26. ACCIDENT PREVENTION AND FIRST AID FACILITIES

In addition to conforming to the applicable governmental regulations and standards referred to in Article "Fire Prevention And Control" of the Information For Bidders, the Contractor shall conduct its work in accordance with the recommendations contained in the latest edition of the "Manual of Accident Prevention in Construction," as published by the Associated General Contractors of America, Inc. and the most recent safety codes approved by the American Standards Association. In case of the conflict with the referenced governmental regulations and standards, the most stringent regulation, standard or recommendation shall govern.

Further, and without in any way limiting the Contractor's obligations hereunder, and in accordance with the instructions of the Construction Administrator, the Contractor shall provide barricades, warning lights, danger and caution signs and other safeguards at all places where the work in any way is a hazard to the public.

The Contractor shall also provide and maintain upon the site at each location where major work is in progress, a completely equipped first aid kit that shall be readily accessible when construction activities are in progress. Posted on each first aid kit shall be the name, location and telephone number of the nearest hospital or doctor with whom the Contractor has previously made arrangements for emergency treatment in case of accident.

27. FIRE PREVENTION AND CONTROL

The Contractor shall abide by such rules and instructions as to fire prevention and control as the municipality having jurisdiction may prescribe. It shall take all necessary steps to prevent its employees from setting fires not required in the construction of the facility and shall be responsible for preventing the escape of fires set in connection with the construction.

It shall at all times provide the proper housekeeping to minimize potential fire hazards, and shall provide approved spark arresters on all steam engines, internal combustion engines and fuels.

Free access to fire hydrants and standpipe connections shall be maintained at all times during construction operations, and portable fire extinguishers shall be provided by the Contractor and made conveniently available throughout the construction site. The Contractor shall also notify its employees of the location of the nearest fire alarm box at all locations where work is in progress.

INFORMATION FOR BIDDERS

28. STATE AND LOCAL SALES TAX EXEMPTION

The Contractor's attention is directed to Section 1115 of the Tax Law of New York State, Chapters 513 and 514 of the Laws of 1974. In connection with capital improvement contracts entered into on or after September 1, 1974, all tangible personal property which will become an integral component of a structure, building or real property of New York State, or any of its political sub-divisions, including the County of Westchester, is exempt from State and local retail sales tax and compensating use tax.

Bidders' proposals shall exclude dollar amounts for the payment of State and Local retail sales tax and compensating use tax, for tangible personal property defined above.

The successful bidder shall be obliged to file the required Contractor Exempt Purchase Certificates, which may be obtained from the New York State Department of Taxation and Finance (1-800-462-8100), in order to utilize such exemption.

29. APPRENTICES

The attention of all bidders is directed to Section 220(3-e) of the New York State Labor Law, which is hereby incorporated herein by reference, which requires, among other things, that "Apprentices who are registered under a Bona Fide New York State Registered Apprentice Training Program shall be permitted to work."

30. AFFIRMATIVE ACTION PROVISION

During the performance of this Contract, the Contractor agrees that it will not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, age or handicap. Contractor shall take affirmative action to ensure that applicants are employed and that employees are treated during employment without regard to their race, color, religion, sex, national origin, age or handicap. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoffs or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. Contractor agrees to include, or require the inclusion of the above provision in any subcontract made pursuant to its contract with the County.

31. AFFIRMATIVE ACTION PROGRAM REQUIREMENT

Relative to the award of this Contract, it is required that all bidders completely answer all questions contained in the questionnaire entitled "Affirmative Action Program Requirement" of the Proposal Pages, and properly attest to same.

It is also required that all subcontractors completely answer all questions contained in the questionnaire entitled "Affirmative Action Program Requirement-Subcontractors" of the Sample Forms, and properly attest to same. This form is to be submitted with the request to utilize subcontractor(s).

INFORMATION FOR BIDDERS

32. AUTHORITY TO DO BUSINESS IN NEW YORK

Any corporation not incorporated under the Laws of New York State, must furnish a copy of its certificate of authority, from the New York State Secretary of State, to do business in the State of New York, in accordance with Article 13 of the New York State Business Corporation Law.

33. LICENSE REQUIREMENTS (ELECTRICAL)

- A. In accordance with the requirements of Local Law No. 20-1997 of Westchester County, no person shall perform work under any contract with the County of Westchester except (i) a licensed Master Electrician; (ii) a licensed "Special Electrician"; or (iii) a Journeyman Electrician working under the direct supervision and control of a Master Electrician.

In no event shall the County incur any liability to pay for any electrical work performed in violation of the licensing requirements of Local Law No. 20-1997 of Westchester County.

- B. Contract with separate bids:

If the project is one where separate bid specifications are required pursuant to the provisions of the New York General Municipal Law, then any person, partnership, corporation, business organization or other business entity submitting a bid for the electrical portion of the project must possess, at the time of submission of the Bid, a valid Master/"Special" Electrician's license issued by the Westchester County Electrical Licensing Board in accordance with Chapter 277 Article XVII of the Laws of Westchester County and the Westchester County Electrical Licensing Board Rules & Regulations, in particular No. 11, which states as follows:

No individual holding a Master Electrician's License shall lend such License to any person or allow any other person to carry on, engage in, or labor at the business as defined herein of installing, removing, altering, testing, replacing, or repairing electrical systems. A violation of this section by any person holding a License shall be sufficient cause for revocation of such License.

However, nothing herein shall be construed to prohibit the use of a License by the holder thereof for or on behalf of a partnership, corporation or other business association, provided that fifty-one (51) percent or more of the control of the voting capital stock of such partnership, corporation, or other business association is owned by one (1) or more holders of a Westchester County Master Electrical License and that all work performed by such partnership, corporation or other business association is performed by or under the direct supervision of such License holder or holders.

- C. Contract with single bid:

Where the project does not involve separate bids pursuant to the New York General Municipal Law but where some electrical work is contemplated along with other work, the person, firm, partnership or corporation engaged to perform said electrical work

INFORMATION FOR BIDDERS

must possess a valid Master/"Special" Electrician's license issued by the Westchester County Electrical Licensing Board.

- D. An electrical bidder must complete the "Certificate of License (Electrical)" of the Proposal Pages and will be required to furnish a copy of such license with the sealed Bid. Other bidders will be required to furnish a copy of such license for the applicable person engaged to perform the electrical work when request by the County, prior to awarding the contract.
- E. The license must be maintained at all times during the performance of the work contemplated under the contract. The suspension, revocation or the failure to maintain or renew such license shall, in addition to any other right or remedy available to the County, be grounds for immediate termination of the contract, effective immediately upon notice from the Commissioner.

34. LICENSE REQUIREMENTS (PLUMBING)

- A. In accordance with the requirements of Chapter 277, Article XV of the Laws of Westchester County, no person shall perform plumbing work under any contract with the County of Westchester except (i) a licensed Master Plumber; (ii) a certified Journey Level Plumber employed by and under the direction of a licensed Master Plumber; or (iii) an Apprentice Plumber working under the direct supervision and control of a Master Plumber or under the direct supervision and control of a certified Journey Level Plumber in the employ of a licensed Master Plumber.

In no event shall the County incur any liability to pay for any plumbing work performed in violation of the licensing requirements of Chapter 277, Article XV of the Laws of Westchester County.

- B. Contract with separate bids:

If the project is one where separate bid specifications are required pursuant to the provisions of the New York General Municipal Law, then any person, partnership, corporation, business organization or other business entity submitting a bid for the plumbing portion of the project must possess, at the time of submission of the Bid, a valid Master Plumber's license issued by the Westchester County Board of Plumbing Examiners in accordance with the Westchester County Board of Plumbing Examiners Rules and Regulations and Chapter 277 Article XV of the Laws of Westchester County, in particular Section 277.509A, which states as follows:

- A. No holder of a license or certification issued under this article shall authorize, consent to or permit the use of his or her license or certification by or on behalf of any other person. No person who has not qualified or obtained a license or certification under this article shall represent himself or herself to the public as holder of a license or certification issued under this article, either directly, by means of signs, sign cards metal plates or stationery, or indirectly in any other manner whatsoever. However, nothing herein shall be construed to prohibit the use of a license by the holder thereof for or on behalf of a partnership, corporation or other business association, provided that 51 percent or more of the control of the voting capital stock of such partnership, corporation or other business

INFORMATION FOR BIDDERS

association is owned by one or more holders of a Westchester County master plumbing license and that all work performed by such partnership, corporation or other business association is performed by or under the direct supervision of such license holder or holders.

C. Contract with single bid:

Where the project does not involve separate bids pursuant to the New York General Municipal Law but where some plumbing work is contemplated along with other work, the person, firm, partnership or corporation engaged to perform said plumbing work must possess a valid Master Plumber's license issued by the Westchester County Board of Plumbing Examiners.

D. A plumbing bidder must complete the "Certificate of License (Plumbing)" of the Proposal Pages and will be required to furnish a copy of such license and the County issued identity badge with the sealed Bid. Other bidders will be required to furnish a copy of such license and the County issued identity badge for the applicable person engaged to perform the plumbing work when request by the County, prior to awarding the contract.

E. A restricted Master Plumber's license issued by the Westchester County Board of Plumbing Examiners shall satisfy the requirements of this section provided such restricted license authorizes the Master Plumber to engage in the business of plumbing within the local municipality in which the work under the contract is to be performed.

F. The license must be maintained at all times during the performance of the work contemplated under the contract. The suspension, revocation or the failure to maintain or renew such license shall, in addition to any other right or remedy available to the County, be grounds for immediate termination of the contract, effective immediately upon notice from the Commissioner.

35. LICENSE REQUIREMENTS (HAULERS)

(Haulers Of Solid Waste; Recyclables; Construction And Demolition Debris; Garden And Yard Waste And/Or Scrap Metal)

A. DEFINITIONS:

- 1) "Class A" refers to all haulers except those whose hauling business is limited solely to Class C, Class D or Class E activities or whose recycling business is limited to Class B activities. Class A Licensees may also conduct Class B, Class C, Class D and Class E activities.
- 2) "Class B" refers to Recyclable brokers. Class B Licensees may also conduct Class C, Class D and Class E activities.
- 3) "Class C" refers to haulers who exclusively handle construction and demolition debris. Class C Licensees may also conduct Class D and Class E activities. With respect to Class C haulers, the following shall apply: a. Class "C-1" shall refer to a business or subsidiary which generates construction and demolition debris, as defined herein, and which, incidental to such business, transports, stores, processes, transfers or disposes of the construction and demolition debris generated by the

INFORMATION FOR BIDDERS

operations of such business or subsidiary. Class "C-1" Licensees may also conduct Class E activities; b. Class "C-2" shall refer to all other businesses which otherwise transport, collect, store, transfer, process, or dispose of construction and demolition debris. Class "C-2" haulers may also conduct Class "C-1", Class D and Class E activities.

- 4) "Class D" refers to (i) haulers who collect, store, transport, transfer, process or dispose of garden and yard waste generated, originated or brought within the County where such garden and yard waste was previously generated by a person or entity other than the Licensees and/or (ii) haulers who collect, store, transport, transfer, process or dispose of garden and yard waste and which own, lease, or control one or more vehicles having three (3) or more axles which vehicles will be used in the collection, storage, transfer, transportation, processing or disposal of garden and yard waste generated, originated or brought within the County.
- 5) "Class E" refers to haulers who exclusively conduct a scrap peddler business.
- 6) "Construction and Demolition Debris" means uncontaminated Solid Waste resulting from the construction, remodeling, repair and demolition of structures and roads, and uncontaminated Solid Waste consisting of vegetation resulting from land clearing and grubbing, utility line maintenance and seasonal and storm-related cleanup. Such waste includes, but is not limited to, bricks, concrete and other masonry materials, soil, rock, wood, wall coverings, plaster, drywall, plumbing fixtures, non-asbestos insulation, roofing shingles, asphaltic pavement, glass, plastics that are not sealed in a manner that conceals other waste, electrical wiring and components containing no hazardous liquids, metals, and trees or tree limbs that are incidental to any of the above.
- 7) "Hauler" means any person excluding municipalities, the County and any County district including, but not limited to, Refuse Disposal District No. 1 and all County sewer and water districts, who, for a fee or other consideration, collects, stores, processes, transfers, transports or disposes of Solid Waste, Recyclables or construction and demolition debris that is generated or originated within the County or brought within the boundaries of the County for disposal, storage, transfer or processing.
- 8) "Recyclables" means those materials defined as "Recyclables" under Section 825.30 (8) of the Westchester County Source Separation Law.
- 9) "Scrap Peddler" shall mean any person who collects scrap materials for sale to a Recyclable broker using no more than one vehicle for collection and transportation of such materials.
- 10) "Solid Waste" means all putrescible and non-putrescible materials or substances, except as described in Paragraph 4 of 6 NYCRR Part 360-1.2(a), and/or regulated under 6 NYCRR Part 364, that are discarded or rejected as being spent, useless, worthless or in excess to the owners at the time of such discard or rejection including, but not limited to, garbage, refuse, commercial waste, rubbish, ashes, incinerator residue and construction and demolition debris. "Solid Waste" shall not be understood to include Recyclables as defined above.

INFORMATION FOR BIDDERS

- B. **PLEASE TAKE NOTICE** - In accordance with the requirements of Chapter 826-a, Article III of the Laws of Westchester County, it is unlawful for any person to collect, store, transfer, transport or dispose of solid waste; recyclables; construction and demolition debris; garden and yard waste and/or scrap metal, as defined herein, that is generated or originated within the County or brought within the boundaries of the County for disposal, storage, transfer or processing, or to conduct any activities defined as Class A, Class B, Class C, Class D or Class E activities under Chapter 826-a of the Laws of Westchester County, in Westchester County (hereinafter collectively referred to as "hauling") without having first obtained a license therefore from the Westchester County Solid Waste Commission.

In no event shall the County incur any liability with respect to any hauling activities conducted by the bidder or any subcontractor of the bidder in violation of Chapter 826-a of the Laws of Westchester County.

- C. Where the project necessitates that hauling be performed, either the bidder or the person, partnership, corporation, business organization or other business entity engaged to perform such hauling work on behalf of the bidder (hereinafter the "subcontractor") must possess a valid license issued by the Westchester County Solid Waste Commission at the time of submission of the bid and throughout the duration of any contract issued pursuant thereto.
- D. A hauler bidder must complete the "Certificate of License (Hauler)" of the Proposal Pages and will be required to furnish a copy of such license with the sealed bid. Other bidders will be required to furnish a copy of such license for the applicable person engaged to perform the hauling work when requested by the County, prior to awarding the contract.
- E. The suspension, revocation, or the failure to maintain or renew such license may, in addition to any other right or remedy available to the County, be grounds for termination of the contract, effective immediately upon notice from the Commissioner. The bidder which is awarded the contract hereunder shall have a continuing obligation to notify the Commissioner, within (2) business days, of any suspension, revocation or other action taken with respect to any license issued by the Westchester County Solid Waste Commission which may limit or impair the bidder's ability, or the ability of any authorized subcontractor, to perform such hauling work in the County of Westchester.

It shall be the bidder's responsibility to ensure that any subcontractor who will perform the hauling services required under any contract issued pursuant to this bid specification has a valid license for the duration of the term of any contract awarded hereunder.

- F. In the event that a license held by the bidder or its subcontractor is revoked, suspended or otherwise discontinued by the Westchester County Solid Waste Commission, or in the event that the bidder is otherwise required to obtain the services of a new or alternate subcontractor for the hauling work, the bidder shall immediately notify the Commissioner and seek the Commissioner's approval for the use of such subcontractor to provide the hauling services which are required under the contract, and shall provide the Commissioner with a copy of the license issued by the Westchester County Solid Waste Commission to such subcontractor. No bidder or subcontractor shall provide

INFORMATION FOR BIDDERS

hauling services under the contract until a copy of its license has been provided to the Commissioner and the Commissioner has approved of such bidder or subcontractor.

36. MINORITY PARTICIPATION POLICY

- A. Pursuant to Chapter 308 of the Laws of the County of Westchester, the County encourages the meaningful and significant participation of business enterprises owned by persons of color and women - Minority Business Enterprise (MBE) and Women Business Enterprise(WBE); on County of Westchester contracts.
- B. It is the goal of the County of Westchester to use its best efforts to encourage, promote and increase participation of business enterprises owned and controlled by persons of color or women (MBE/WBE) in contracts and projects funded by all departments of the County and to develop a policy to efficiently and effectively monitor such participation.
- C. In recognition of the need to promote the development of business enterprises owned and controlled by persons of color and women to achieve a goal of equal opportunity, and overcome the existing under representation of these groups in the business community, the County of Westchester acting through its Office of Economic Development shall as a lawful public and County purpose provide technical and informational assistance to such business enterprises with a particular emphasis on education programs to encourage participation in the contract procurement process.
- D. For the purposes of this Local Law, a business enterprise owned and controlled by women or persons of color shall be construed to mean a business enterprise including a sole proprietorship, partnership or corporation that is: (a) at least 51% owned by one or more persons of color or women; (b) an enterprise in which such ownership by persons of color or women is real, substantial and continuing; (c) an enterprise in which such ownership interest by persons of color or women has and exercises the authority to control and operate, independently, the day-to-day business decisions of the enterprise; and (d) an enterprise authorized to do business in this state which is independently owned and operated. In addition, a business enterprise owned and controlled by persons of color or women shall be deemed to include any business enterprise certified as an MBE or WBE pursuant to Article 15-a of the New York State Executive Law and implementing regulations, 9 NYCRR Subtitle N Part 540 et seq., or as a small disadvantaged business concern pursuant to the Small Business Act, 15 U.S.C. 631 et seq., and the relevant provisions of the Code of Federal Regulations as amended.
- E. The Contractor hereby acknowledges and agrees:
 - 1) That in the hiring of employees for the performance of work under this contract or any subcontract hereunder, no contractor, subcontractor, nor any person acting on behalf of such contractor or subcontractor, shall be reason of race, creed, color, religion, gender, age, ethnicity, disability, sex, alienage or citizenship status, national origin, marital status, sexual orientation, familial status, genetic predisposition or carrier status discriminate against any citizen of the State of New York who is qualified and available to perform the work to which the employment relates;

INFORMATION FOR BIDDERS

- 2) That no 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, religion, gender, age, ethnicity, disability, sex, alienage or citizenship status, national origin, marital status, sexual orientation, familial status, genetic predisposition or carrier status;
 - 3) That there may be deducted from the amount payable to the contractor by the County under this contract a penalty of fifty (50) dollars for each person for each calendar day during which such person was discriminated against or intimidated in violation of the provisions of the contract;
 - 4) That this contract may be canceled or terminated by the County, 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 section of the contract; and
 - 5) The aforesaid provisions of this section covering every contract for or on behalf of the County 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.
 - 6) Contractor agrees to include, or require the inclusion of the above provision in any subcontract made pursuant to its contract with the County.
- F. In furtherance of the Contractor's obligation to make documented good faith efforts to utilize Minority Business Enterprises (MBE) and Women's Business Enterprises (WBE) for the Work required by this Contract, the Contractor shall provide the Minority/Women Business Enterprise Questionnaire signed by an officer of the Contractor, and any additional information requested by the County, including but not limited to the following, which shall be delivered to the Construction Administrator and _____, Program Manager of Minority- and Women-Owned Business Program, County of Westchester, Room 911, 148 Martine Avenue, White Plains, New York 10601 coincident with the Contractor's delivery to the County of its bid and shall be provided by the Contractor with any request for approval of subcontractors:
- 1 (a) The name, address, telephone number and contact person of each MBE and WBE solicited verbally by Contractor during the applicable period for the performance of any portion of the Contractor's Work and the date(s) that each such solicitation was made;
 - 1 (b) A description of the portion of the Contractor's Work for which each such solicitation is made.
 - 1 (c) A listing of the project documents, if any, furnished to each such MBE and WBE.
 2. A copy of each written solicitation sent by the Contractor to each MBE and WBE and the name and address of each MBE and WBE to whom the solicitation was made.
 - 3) The name and address of each MBE and WBE that performs any portion of the Contractor's Work, a description of such portion of the Work and the dollar

INFORMATION FOR BIDDERS

amount therefore.

- 4) A statement that the Contractor reviewed a list of MBE and WBE contractors in their outreach efforts. A list can be found at www.westchestergov.com/mwob.
- 5) Indicate those MBE and WBE contractors found on the list that provided the type of subcontractor services required for this project. If none were found, please indicate.
- 6) Describe other outreach efforts, including other MBE and/or WBE lists, organizations or individuals that were contacted.

The failure of the low bidder to comply with the provisions of this subparagraph F may result in the County NOT awarding this contract to your firm. Failure of the Contractor to comply with the provisions of this subparagraph F may constitute a material breach of this Contract. Failure to comply with the Minority Participation Policy may be considered by the County when awarding contracts.

37. SEXUAL HARASSMENT POLICY

- A. As with discrimination involving race, color, religion, age, sexual orientation, disability, and national origin, Westchester County also prohibits sex discrimination, including sexual harassment of its employees in any form. The County will take all steps necessary to prevent and stop the occurrence of sexual harassment in the workplace.
 - 1) **This policy applies to all County employees and all personnel in a contractual relationship with the County.** Depending on the extent of the County's exercise of control, this policy may be applied to the conduct of non-County employees with respect to sexual harassment of County employees in the workplace.
 - 2) This sexual harassment policy includes, but is not limited to, inappropriate forms of behavior described by the Equal Employment Opportunity Commission.
- B. Sexual advances that are not welcome, requests for sexual favors, and other verbal or physical conduct of a sexual nature constitutes sexual harassment when:
 - 1) Submission to such conduct is made either explicitly or implicitly a term or condition of an individual's employment; -OR-
 - 2) Submission to or rejection of such conduct by an individual is used as the basis for employment decisions, such as promotion, transfer, or termination, affecting such individuals; -OR-
 - 3) Such conduct has the purpose or effect of unreasonably interfering with an individual's work performance or creating an intimidating, hostile or offensive working environment.
- C. Sexual harassment refers to behavior that is not welcome, that is personally offensive, that fails to respect the rights of others, that lowers morale and that, therefore, interferes

INFORMATION FOR BIDDERS

with an employee's work performance and effectiveness or creates an intimidating, hostile or offensive working environment.

38. SMOKE-FREE WORKPLACE POLICY

- A. By way of Executive Order No. 5 of 1998 and Local Law 3 of 2003, it is now the policy of the County of Westchester to institute a smoke-free “workplace”.
- B. Every indoor County “workplace”, shall become a smoke-free area. The smoking or carrying of lighted cigarettes, cigars, pipes, or any other tobacco-based products, or products that result in smoke, is hereby banned.
- C. Every indoor County “workplace” shall be covered under this Executive Order, including the County Jail in Valhalla and the Westchester County Center in White Plains. This Executive Order shall not, however, apply to County-owned facilities that are not County “workplaces”, such as employees housing or privately run restaurants on County property (e.g. at the County golf courses).
- D. The Richard J. Daronco County Courthouse shall not, for purposes of this Executive Order, be considered a County “workplace”, and therefore shall not be required to be smoke-free.
- E. This Executive Order is intended to be consistent with, and not modify, any provisions of the New York State Public Health Law.
- F. This Executive Order shall take effect immediately and remain in full force and effect until otherwise superseded or revoked.

39. COUNTY ENERGY EFFICIENT PURCHASING POLICY

- A. By way of Executive Order No. 9 of 2002, it is now the policy of the County of Westchester to institute an Energy Efficient Purchasing Policy.
- B. This policy shall apply to all purchases made by and for the County in accordance with applicable laws, rules and regulations.
- C. Wherever the price is reasonably competitive and the quality adequate for the purpose intended, purchase and utilization of products that meet Energy Star requirements for energy efficiency as determined by the United States Environmental Protection Agency and the United States Department of Energy is hereby recommended.
- D. If the Energy Star label is not available with respect to a particular product, than it is recommended that products in the upper twenty-five percent of energy efficiency as designated by the United States Federal Energy Management Program shall be purchased and utilized if the prices of those products are reasonably competitive and the quality adequate for the purpose intended.

40. RESTRICTION ON USE OF TROPICAL HARDWOODS

- A. The bidder/proposer shall not use or propose to use any tropical hardwoods or tropical hardwood products in any form, except in accordance with State Finance Law § 165 (Use of Tropical Hardwoods), as may be amended from time to time. Pursuant to the

INFORMATION FOR BIDDERS

State Finance Law § 165, any bid/proposal which proposes or calls for the use of any tropical hardwood or wood product in the performance of the contract shall be deemed non-responsive.

41. DISCLOSURE OF RELATIONSHIPS TO COUNTY

- A. The successful bidder is required to complete the form entitled “Required Disclosure of Relationships to County” on Proposal Pages 32-33 before award of the contract.
- B. In the event that any information provided on the completed Proposal Pages entitled “Required Disclosure of Relationships to County” changes during the term of this agreement, the Contractor shall notify the Commissioner in writing within ten (10) days of such event by submitting a revised “Required Disclosure of Relationships to County” form.

42. CONTRACTOR DISCLOSURE STATEMENT

The Contractor and each Major Subcontractor represents that all information provided by the Contractor and Major Subcontractor in the form entitled “Contractor Disclosure Statement” on Proposal Pages 23-31 is in all respects true and correct. In the event the information provided on that document changes during the term of this agreement or for a period of three (3) years after the date that the Contractor and/or the Major Subcontractor receives final payment under this agreement, the Contractor and/or Major Subcontractor shall notify the Commissioner in writing within ten (10) days of such event by submitting a revised “Contractor/Major Subcontractor Disclosure Statement”. Bidders must complete the Required Disclosure of Relationships to County form. The Required Disclosure of Relationships to County form is located on Proposal Pages 32-33.

43. CRIMINAL BACKGROUND INFORMATION

Pursuant to Executive Order 1-2008 and subject to the applicable provisions of New York Correction Law §§ 752 and 753, the County shall have the right to bar the following “Persons Subject to Disclosure” (Persons shall mean individuals or legal entities) from providing work or services to the County or from being on County property:

(a) Consultants, Contractors, Licensees, Lessees of County owned real property, their principals, agents, employees, volunteers or any other person acting on behalf of said Contractor, Consultant, Licensee, or Lessee who is at least sixteen (16) years old, including but not limited to Subconsultants, Subcontractors, Sublessees or Sublicensees who are providing services to the County; and

(b) Any family member or other person, who is at least sixteen (16) years old, residing in the household of a County employee who lives in housing provided by the County located on County property.

If any of the above mentioned Persons Subject to Disclosure has either one of the following:

(a) A conviction of a crime (all felonies and misdemeanors as defined under the New York State Penal Law or the equivalent under Federal law or the laws of any other State);

(b) A pending criminal proceeding for a crime(s) as defined above; or

INFORMATION FOR BIDDERS

(c) A refusal to answer such questions.

Where the following criteria apply:

(a) If any of the Persons Subject to Disclosure providing work or services to the County in relation to a County Contract are not subject to constant monitoring by County staff while performing tasks and/or while such persons are present on County property pursuant to the County Contract; and

(b) If any of the Persons Subject to Disclosure providing work or services to the County, in relation to a County Contract may, in the course of providing those services, have access to sensitive data (for example, Social Security Numbers and other personal/secure data); facilities (secure facilities and/or communication equipment); and/or vulnerable populations (for example, children, seniors and the infirm).

Accordingly, the Contractor is required to review the Instructions found in the instructions and complete “Contractor and all persons subject to Disclosure Certification Forms” located at Forms Pages 11-13 as well as any other applicable criminal disclosure forms (i.e., Forms Pages 14 through 19,” together with Forms Pages 11-13 collectively referred to as “Disclosure Forms”).

However, the following Persons Subject to Disclosure are **exempt** from Executive Order 1-2008: (i) those persons for whom the County has already conducted a background check and issued a security clearance that is in full force and effect; or (ii) those persons for whom another state or federal agency having appropriate jurisdiction has conducted a security and/or background clearance or has implemented other protocols or criteria for this purpose that apply to the subject matter of this Contract that is in full force and effect.

If a Person Subject to Disclosure is exempt from the disclosure described in Executive Order 1-2008 because of either “i” or “ii” above, then the Contractor shall notify the Procuring Officer¹ in the respective Department of its claim of exemption and it shall be the responsibility of the Procuring Officer to verify each exemption. If the Procuring Officer determines that the Contractor is exempt under sections “i” or “ii” above, the Procuring Officer shall confirm same with the Contractor and maintain a written record including all supporting details of the verification of and acknowledgement of said exemption.

If the Procuring Officer determines that the Contractor is not exempt under sections “i” or “ii” above, the Procuring Officer shall notify the Contractor in writing, and the appropriate Disclosure Forms shall be required.

It shall be the Contractor’s duty to disclose and to inquire of each and every Person Subject to Disclosure, whether they have been convicted of a crime or whether they are currently subject to pending criminal charges. It shall be the duty of the Contractor to submit a completed Certification Form “Forms Pages 11-13”annexed hereto as ,” which certifies that the Contractor and every Person Subject to Disclosure has been asked whether they have been convicted of a crime or are currently subject to pending criminal charges.

Should the Contractor or any Person Subject to Disclosure (also referred to as “Person”)

¹ “Procuring Officer” shall mean the head of the department or the individual(s) authorized by the head(s) of the department(s) undertaking the procurement and with respect to those matters delegated to the Bureau of Purchase and Supply pursuant to Section 161.11(a) of the Laws of Westchester County, the Purchasing Agent.

INFORMATION FOR BIDDERS

affirmatively advise that they have been convicted of a crime said Person shall be identified in Forms Page 14 entitled “Names And Titles Of Persons Subject To Disclosure That Answered Yes” to any questions on Forms Pages 11-13 and shall complete Forms Pages 15-16 entitled, “Criminal Background Disclosure Form For Persons Who Have Been Convicted of A Crime.”

Should the Contractor or any Person Subject to Disclosure advise that they are subject to pending criminal charges, said Person shall be identified in Forms Page 14 and shall complete the form annexed hereto as Forms Pages 17-18 entitled, “Criminal Background Disclosure Form For Persons Who Are Subject to Pending Criminal Charges.”

Should the Contractor or any Person Subject to Disclosure refuse to answer whether they have been convicted of a crime or are currently subject to pending criminal charges, the name and title of said Person(s) shall be listed on Forms Page 19 entitled “Persons That refused To Answer”.

It shall be the duty of the Contractor to submit to the Procuring Officer all of the attached applicable Disclosure Forms prior to the commencement of this Contract. It is the responsibility of each Contractor to assure that all of their proposed Subcontractors complete the criminal background and disclosure certification forms and submit the forms to the Procuring Officer before they will be approved to perform work on the contract.

Under no circumstances shall the existence of a language barrier serve as a basis for the waiver of or an exception to this obligation. If the Contractor needs to obtain translation services to fulfill this obligation, it shall be at the sole cost and expense of the Contractor.

The Contractor shall be required to make the same inquiry and forward updated Disclosure Forms to the Procuring Officer regarding additional Persons Subject to Disclosure in connection with this Contract during the term of this Contract. **NO NEW PERSON SUBJECT TO DISCLOSURE SHALL PERFORM WORK OR SERVICES OR ENTER ONTO COUNTY PREMISES UNTIL THE UPDATED DISCLOSURE FORMS ARE FILED WITH THE PROCURING OFFICER.**

THE CONTRACTOR HAS A CONTINUING OBLIGATION TO MAINTAIN THE ACCURACY OF THE DISCLOSURE FORMS FOR THE DURATION OF THIS CONTRACT, INCLUDING ANY AMENDMENTS OR EXTENSIONS THERETO AND SHALL PROVIDE ANY UPDATES TO THE PROCURING OFFICER AS NECESSARY TO COMPLY WITH THE DISCLOSURE REQUIREMENTS BY EXECUTIVE ORDER 1-2008.

Any failure by the Contractor to comply with the disclosure requirements of Executive Order 1-2008, absent proof of exemption deemed satisfactory by the County Procuring Officer, may be considered by the County, a material breach by the Contractor and may be grounds for immediate termination of this Agreement by the County.

44. MANDATORY OSHA CONSTRUCTION SAFETY AND HEALTH TRAINING

Pursuant to NYS Labor Law §220-h – On all public work projects of at least \$250,000 all laborers, workers and mechanics employed, in the performance of the contract on the public work site, either by the contractor, sub-contractor or other person doing or contracting to do the

INFORMATION FOR BIDDERS

whole or a part of the work contemplated by the contract, are required to be certified as having successfully completed an OSHA construction safety and health course of at least 10 hours prior to performing any work on the project.



3. GENERAL CLAUSES

DEPARTMENT OF PUBLIC WORKS

Division of Engineering

GENERAL CLAUSES

1. MATERIAL AND WORKMANSHIP

It is the intent of these specifications to require first-class work and new and best quality materials. For any unexpected features arising during the progress of the work and not fully covered herein the specifications shall be interpreted to require first-class work and materials, and such interpretations shall be binding upon the Contractor.

- 1) Upon award of the Contract, the Contractor shall furnish in writing to the Construction Administrator the sources of supply for concrete, and other materials that it proposes to use in the work, and material shall not be furnished from other sources of supply except after written approval by the Construction Administrator. The Contractor shall, before ordering equipment verify that Suppliers of equipment will provide the required warranties, guarantees, and maintenance services.

2. DEFINITIONS

COMMISSIONER - The head of the Department of Public Works of the County of Westchester.

CONSTRUCTION ADMINISTRATOR- The representative of the Commissioner of Public Works at the project site who, unless specifically designated otherwise in the Contract, shall in the first instance, make such determinations as are necessary for the expeditious completion of the Work, except for those determinations that are reserved to the Commissioner.

CONTRACT - Shall mean each of the various parts of these documents both as a whole or severally and except for titles, subtitles, headings and table of contents, shall include the Notice to Bidders, Information for Bidders, the Proposal, the Specifications, the Performance Bond, the Plans, the Contract Form, and all addenda and provisions required by law.

CONTRACTOR - Party of the second part to the Contract acting directly or through its agents, subcontractors, or employees, and who is responsible for all debts pertaining to and for the acceptable performance of the work for which it had contracted.

COUNTY - Party of the first part to the Contract as represented by the Board of Acquisition and Contract and the Commissioner of Public Works for the County of Westchester.

ENGINEER - An Engineer or Architect that designed the project and is serving as the duly authorized representative of the Commissioner of Public Works who, in addition to the duties set forth in the Contract, shall, in the first instance, make such determinations as are necessary to ensure the Contractor's compliance with its obligations for the preparation and submission of shop drawings and all other submittals required for the Work. If there is no Engineer the duties of the Engineer shall be performed by the Construction Administrator and all references in this

GENERAL CLAUSES

Agreement to the Engineer shall be deemed to mean the Construction Administrator.

MAJOR SUBCONTRACTOR- Subcontractors performing all or a portion of the work for Electrical; Heating, Ventilating and Air Conditioning; Fire Prevention; General Construction; and/or any Subcontractor whose subcontract price is equal to or greater than ten percent (10%) of the Contract Price.

OWNER - The County of Westchester.

PLANS - All official drawings or reproductions of drawings pertaining to the work or to any structure connected therewith.

SPECIFICATIONS - The body of directions, requirements, etc. contained in this present volume, together with all documents of any descriptions and agreements made (or to be made), pertaining to the methods(or manner) of performing the work or to the quantities and quality. Specifications shall also include the Notice to Contractors, Instructions to Bidders, Bond, Proposal and Contract Agreement.

SURETY - The corporate body, which is bound with and for the Contractor and which engages to be responsible for the faithful performance of the contract, and to indemnify the County against all claims for damages.

A.A.S.H.O. - American Association of State Highway Officials

A.R.E.A. - American Railway Engineering Association

A.S.T.M. - American Society for Testing Materials

A.W.W.A. - American Water Works Association

N.E.C. - National Electrical Code

N.E.M.A. - National Electric Manufacturers Association

3. BOUNDARIES OF WORK

The County will provide land or rights-of-way for the work specified in this Contract. Other contractors, employees or concessionaires of the county, may for all necessary purposes enter upon the work and premises used by the Contractor, and the Contractor shall give to other contractors and employees of the County all reasonable facilities and assistance for the completion of adjoining work.

4. OVERLAPPING WORK

The Contractor shall take notice that because of work on other contracts within and adjacent to the contract limits it may not have exclusive occupancy of the territory within or adjacent

GENERAL CLAUSES

to the contract limits, and that during the life of this contract the owners and operators of Public Utilities may make changes in their facilities.

The said changes may be made by utility employees or by contract within or adjacent to the contract limits and may be both temporary and permanent.

The Contractor shall cooperate with other Contractors and owners of various utilities and shall coordinate and arrange the sequence of its work to conform with the progressive operations of work already or to be put under contract. Cooperation with Contractors already or to be engaged upon the site is essential to properly coordinate the construction efforts of all Contractors, Utility Owners and Subcontractors engaged in work within and adjacent to the contract limits.

The Contractor shall coordinate the work of its various Subcontractors. Their respective operations shall be arranged and conducted so that delays are avoided. Where the work of the Contractor or Subcontractor overlaps or dovetails with that of other Contractors, materials shall be delivered and operations conducted so as to carry on the work continuously in an efficient and workmanlike manner. The Contractor shall coordinate its work to be done hereunder with the work of the other Contractor(s) and the Contractor shall fully cooperate with such other Contractor(s) and carefully fit its own work to that provided under other contracts as may be directed by the Construction Administrator. If the Construction Administrator shall determine that the Contractor is failing to coordinate its work with the work of the other Contractor(s) as the Construction Administrator has directed, then the Commissioner shall have the right, at its sole option, to withhold any payments otherwise due hereunder until the Construction Administrator's directions are complied with by the Contractor and/or deduct the costs incurred by the County due to the Contractor's failure or refusal to so cooperate. Delays or oversights on the part of the Contractor or Subcontractors or Utility Owners in performing their work in the proper manner thereby causing cutting, removing and replacing work already in place, shall not be the basis for a claim for extra compensation.

In the event of interference between operations of Utility Owners and other Contractors, or among the Contractors themselves, the Construction Administrator shall be the sole judge of the rights of each Contractor insofar as the sequence of work necessary to expedite the completion of the entire project, and in all cases its decision shall be final. The Contractor agrees that it has included in its unit prices bid for the various items of the contract the possible additional cost of performing the work under this contract because it may not have a clear site for its work and because of possible interference of roadway use, other Contractors and necessary utility work, and the necessity or desirability of opening certain sections of pavement to traffic before the entire work is completed. The County shall not be liable for any damages suffered by any Contractor by reason of another Contractor's failure to comply with the directions of the Construction Administrator, or by reason of another Contractor's default in performance or by any act or failure to act of any Utility Owner or anyone working on its behalf, it being understood that the County does not guarantee the responsibility or continued efficiency of any Contractor or Utility Owner and under no circumstances shall the County be liable to any Contractor or Utility Owner for any delays, interferences or any other impediment or hindrance to the Contractor's or Utility Owner's work .

GENERAL CLAUSES

Should the Contractor sustain any damage through any act or omission of any other contractor having a Contract with the County 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 supplier or subcontractor of whatever tier of such contractor, the Contractor shall have no claim against the County for such damage, but shall have a right to recover such damage from the other contractor under the provision similar to the following provision that has been or will be inserted in the Contracts with such other contractors.

Should any other Contractor having or who shall hereafter have a Contract with the County for the performance of work upon the site sustain any damage through any act or omission of the Contractor hereunder or through the act or omission of any subcontractor of whatever tier of the Contractor, the Contractor agrees to reimburse such other Contractor for all such damages and to defend at his own expense any suit based upon such claim and if any judgment or claims against the County shall be allowed the Contractor shall pay or satisfy such judgment or claim and pay all costs and expenses, including attorney's fees, incurred by the County in connection therewith and to indemnify and hold the County harmless from all such claims.

The County's right to indemnification hereunder shall not be diminished or waived by its assessment against the Contractor of liquidated damages as may be provided elsewhere herein.

Delays in availability of any part of the site or any delays due to interference between the several Contractors and the Utility Owners shall be compensated for by the Construction Administrator solely through granting an extension of time in which to complete the work of the contract without assessment of Engineering charges. The Contractor in submitting its bid hereby agrees that it shall make no other claim against the County for any damages due to such delays or interference.

5. PROPER METHOD OF WORK AND PROPER MATERIALS

The Construction Administrator shall have the power in general to direct the order and sequence of the work, which will be such as to permit the entire work under this contract to be begun and to proceed as rapidly as possible, and such as to bring the several parts of the work to a successful completion at about the same time.

If at any time before the commencement or during the progress of the work the materials and appliances used or to be used appear to the Construction Administrator as insufficient or improper for securing the quality of work required, or the required rate of progress, he may order the Contractor to increase their efficiency or to improve their character, and the Contractor shall promptly conform to such order; but the failure of the Construction Administrator to demand any increase of such efficiency or improvement shall not release the Contractor from its obligation to secure the quality of work or the rate of progress specified.

GENERAL CLAUSES

6. CONTROL OF AREA

Unloading of materials and parking of equipment shall be subject to the orders of the Construction Administrator so far as he may find necessary for the protection and safety of the traveling public and the preservation of property.

7. PERMITS, FEES, ETC.

The County will obtain at its sole cost the necessary New York State Pollutant Discharge Elimination System (“SPDES”) Permit and will sign the associated Notice of Intent (“NOI”). The Contractor and its subcontractors will sign the required Certification Statement (a copy of which is contained as Proposal Page) when it signs the contract.

All necessary permits from County, State or other concerned Public Authorities shall be secured at the cost and expense of the Contractor. It shall also give all notices required by law, ordinance, or the rules and regulations of the concerned Public Bureaus or Departments, and also as a part of the Contract, comply without extra charge or compensation with all State Laws and all other Ordinances or Regulations that may be applicable to this work. Contractor, however, shall first notify the Commissioner before proceeding with securing of all necessary permits and the giving of required notices.

8. TRAFFIC

The General Contractor shall be responsible for the Maintenance and Protection of traffic at all times until the date of completion and acceptance of its work.

During the whole course of the work the Contractor shall so conduct its work and operations so as to interfere with traffic passing the work as little as possible and effect by every reasonable means the safety and comfort of pedestrians, vehicles and vehicle passengers passing the work.

9. INSPECTION

The Contractor shall at all times provide convenient access and safe and proper facilities for the inspection of all parts of the work. No work, except such shop work as may be so permitted, shall be done except in the presence of the Construction Administrator or his/her assistants. No material of any kind shall be used upon the work until it has been inspected and accepted by the Construction Administrator. All materials rejected shall be immediately removed from the work and not again offered for inspection. Any materials or workmanship found at any time to be defective shall be remedied at once, regardless of previous inspection. The inspection and supervision of the work by the Construction Administrator is intended to aid the Contractor in supplying labor and materials in accordance with the specifications, but such inspection shall not operate to release the Contractor from any of its contract obligations.

10. STOPPING WORK

The Commissioner, Construction Administrator or Engineer may stop by written order any work or any part of the work under this contract if, in his/her opinion, the methods employed

GENERAL CLAUSES

or conditions are such that unsatisfactory work might result. When work is so stopped it shall not be resumed until the methods or conditions are revised to the satisfaction of the Commissioner, which must be signified in writing. The Contractor agrees to make no claim for increased costs arising from the issuance of any stop work order.

11. DIMENSIONS

Figured dimensions on the plans shall be given preference over scaled dimensions, but shall be checked by the Contractor before starting construction. Any errors, omissions or discrepancies shall be brought to the attention of the Engineer and his/her decision thereon shall be final.

12. PAYMENTS TO COUNTY

Wherever in the Contract Documents the Contractor is required to make a payment to the County, the Contractor agrees that the County has the option to withhold such sum(s) from payments otherwise due to the Contractor and that all such sums withheld shall be deemed not to be earned by the Contractor.

13. PROTECTION OF UTILITIES AND STRUCTURES

The Contractor shall be responsible for the preservation of all public and private underground and surface utilities/structures at or adjacent to the construction work; insofar as they may be endangered by the work. This shall hold true whether or not they are shown on the contract drawings. If they are shown on the drawings, the County does not guarantee their locations even though the information will be from the best available sources.

The Contractor shall give ample and reasonable notice to all private, corporate or municipal owners before work is done near their utility or structure; shall properly protect all utilities/structures encountered; shall at their expense repair/replace any items that are damaged; and shall proceed with caution to prevent undue interruptions to utility services.

Investigation and/or on-site mark-out, by the County, must be done prior to excavation work at the Valhalla Campus. This investigation/mark-out is to serve as a guide for the Contractor and does not absolve the Contractor from the responsibility to repair/replace identified or non-identified utilities/structures, at no cost to the County.

All excavation work performed at the Valhalla Campus requires the submission of a completed "Ground Penetration" form/sketch(es) will be distributed to the appropriate utility owners. Therefore, the Contractor should assume that no excavation work can be performed until approximately twenty (20) working days after submission of the form/sketch(es), but not prior to approval by the DPW-BO Superintendent of Buildings.

14. PROTECTION OF WATER RESOURCES & THE ENVIRONMENT

The Contractor is responsible to review the specifications and drawings as they relate to this Agreement to ascertain what procedures must be followed in order to comply with all applicable stormwater management, water quality control, erosion, and sediment control

GENERAL CLAUSES

laws, rules, regulations and permits. If the Contractor is of the opinion that any work required, necessitated, or contained in the specifications or otherwise ordered conflicts with the applicable stormwater management, water quality control, erosion, and sediment control laws, rules, regulations, procedures, and permits, including, without limitation, all applicable provisions of the New York State Stormwater Management Design Manual, and the New York Standards and Specifications for Erosion and Sediment Control as they may be amended from time to time, it must promptly notify the First Deputy Commissioner of the Department of Public Works in writing.

In addition to all other requirements contained in this Agreement, the Contractor recognizes and understands that it is an essential element of this Agreement that the Contractor complies with the County's policies to protect water resources and the environment. The Contractor must comply with all applicable stormwater management, water quality control, erosion, and sediment control laws, rules, regulations, permits, procedures and specifications, including, without limitation, all applicable provisions of the New York State Stormwater Management Design Manual,¹ the New York Standards and Specifications for Erosion and Sediment Control as they may be amended from time to time. All of these documents should be obtained from the New York State Department of Environmental Conservation to ensure that the Contractor has the latest version. It should be noted that the standards set forth in the New York State Stormwater Management Design Manual, and the New York Standards and Specifications for Erosion and Sediment Control apply to ALL work done for the County, regardless of the size of the project. In case of a conflict among the governmental regulations and standards, the most stringent regulation, standard or recommendation shall apply to the work done under this Agreement.

The Contractor and its subcontractors shall execute the required Stormwater Pollution Prevention Certification, which is located at Proposal Page 20. In addition, the Contractor acknowledges that if the work required under this Agreement requires that a State Pollutant Discharge Elimination System ("SPDES") permit be obtained from the New York State Department of Environmental Conservation, then the Contractor must comply with the terms and conditions of the SPDES permit for stormwater discharges from construction activities and the Contractor will not take any action or fail to take any necessary action that will result in the County being held to be in violation of said permit or any other permit. The Contractor shall cooperate with the County in obtaining the permit and comply with the SPDES permit and all other applicable laws, rules, regulations and permits.

The Contractor shall provide, as the Commissioner or his designee may request, proof of compliance with the County's policies to protect water resources and the environment, and all applicable stormwater management, water quality control, erosion and sediment control laws, rules, regulations, permits, procedures and specifications.

The Contractor is responsible to ascertain which of the laws, rules, regulations, permits and standards referenced above affect its construction activities, and the Contractor shall be solely responsible for all costs and expenses, including any penalties or fines, incurred by the County, due to the Contractor's failure to comply with such applicable laws, rules,

¹ available at <http://www.dec.state.ny.us/website/dow/swmanual/swmanual.html> - The location of this reference is provided to assist the Contractor; it does not relieve the Contractor from the obligation of obtaining and complying with the latest version of the document.

GENERAL CLAUSES

permits, regulations, standards and County policies. The Contractor shall be responsible to defend and indemnify the County from any and all claims resulting from the Contractor's failure to comply with the applicable laws, rules, regulations, permits, standards and County policies.

Failure of the Contractor to comply with the County's policies to protect water resources and the environment, and all applicable stormwater management, water quality control, erosion and sediment control laws, rules, regulations, permits, procedures and specifications may result in the withholding of progress payments to the Contractor by the County. Such withholding of progress payments shall not relieve the Contractor of any requirements of the Agreement including the completion of the work within the specified time, and any construction sequence requirement of the Agreement.

The Contractor acknowledges that its failure to comply with the County's policies to protect water resources and the environment, and all applicable stormwater management, water quality control, erosion and sediment control laws, rules, regulations, permits, procedures and specifications shall constitute a material breach under this contract. For the breach or violation of this provision, without limiting any other rights or remedies to which the County may be entitled, the County shall have the right, in its sole discretion to suspend, discontinue or terminate this Agreement immediately upon notice to the Contractor. In such event, the Contractor shall be liable to the County for any additional costs incurred by the County in the completion of the project.

The failure of the Contractor to comply with these requirements could lead to a determination that the Contractor is not a responsible bidder when the Contractor is bidding on other projects.

15. SANITARY REGULATIONS

The Contractor shall obey and enforce such sanitary regulations and orders and shall take such precautions against infectious diseases as may be deemed necessary. The building of shanties or other structures for housing the men, tools, machinery or supplies will be permitted only at approved places, and the sanitary condition of the grounds in and at such shanties or other structures must be at all times maintained in a satisfactory manner.

16. CLEANING UP

Upon completion of the work, the Contractor shall remove all equipment, rubbish, debris and surplus materials from the buildings, and grounds, and provide a suitable dumping place for such materials. The premises shall be left in a neat, clean and acceptable condition.

No litter, debris of any kind shall be allowed to accumulate for more than one day in any portion of the buildings or grounds, and must be removed from the area at the end of each workday.

17. PREVENTION OF DUST HAZARD

In accordance with the New York State Labor Law, Section 22a, in the event a silica or other harmful dust hazard is created due to construction operations under the contract, the Contractor shall install, maintain and keep in effective operation the appliances and methods

GENERAL CLAUSES

for the elimination of such silica dust or other harmful dust as have been recommended and approved by State and local authorities.

18. REPRESENTATIVE ALWAYS PRESENT

The Contractor in case of its absence from the work shall have a competent representative **fluent in English** or foreman present, who shall obey without delay, all instructions of the Construction Administrator in the prosecution and completion of the work in conformity with this contract, and shall have full authority to supply labor and material immediately.

19. WORK IN BAD WEATHER

During freezing, stormy or inclement weather, no work shall be done except such as can be done satisfactorily and in a manner to secure first-class construction throughout.

20. PROTECTION OF WORK UNTIL COMPLETION

The Contractor shall be responsible for the protection and maintenance of its work until the same has been accepted by the Owner and shall make good any damage to the work caused by floods, storms, settlements, accidents, or acts of negligence by its employees or others so that the complete work when turned over to the Owner will be in first-class condition and in accordance with the plans and specifications.

21. REMOVAL OF TEMPORARY STRUCTURES AND CLEANING UP

On or before the completion of the work the Contractor shall, without charge therefore, tear down and remove all buildings and other structures built by him for facilitating the carrying out of the work, shall remove all rubbish of all kinds from the grounds which he has occupied, shall do any small amount of additional trimming and grading and shall leave the entire work and premises clean, neat and in good condition. The Contractor shall provide at its own expense suitable dumping places for such material. When the necessity for protecting traffic ends, the Contractor shall remove all signs, lighting devices, barricades and temporary railings from the site of the work.

22. GROSS LOADS HAULED ON HIGHWAY

The Contractor shall at no time during the construction of this contract, haul gross loads exceeding the legal limit prescribed by the Highway Law over the highways of access to, or the highway included in this contract.

23. CONCRETE BATCH PROPORTIONS - YIELD

No Construction Administrator or Engineer is authorized to instruct or inform the Contractor, or any of its agents or employees, or its concrete supplier as to the weights of the ingredients to be used to produce a cubic yard of concrete or as to the yield to be used to produce a cubic yard of concrete or as to the yield to be expected from any batch. The Contractor shall make its own determination and give its own instructions to its agents, employees and concrete supplier as to the total quantity of ingredients to be purchased as a

GENERAL CLAUSES

cubic yard of concrete. The right is reserved to the Construction Administrator and Engineer, however, to verify yields after batch weights have been established by the Contractor and to order a reduction in total weight per load in the event his/her calculations show that the rated capacity of truck mixers, if approved for use, will be exceeded.

24. DAMAGE DUE TO CONTRACTOR'S OPERATIONS

In the event that damage is caused to structures, surfacing, pavement, shrubbery, trees or to grassed areas through trucking operations, delivery of materials, the actual performance of the work, or other causes, the Contractor shall fully restore the same to their original condition at its own expense. In the event that more than one contractor causes damages to any one area, the Director of Project Management will apportion the amount of repair work to be done by each contractor. The decision of the Director of Project Management shall be final and binding upon the Contractor(s) and may not be challenged except pursuant to a proceeding brought pursuant to Article 78 of the Civil Practice Law and Rules.

25. PROPERTY DAMAGE

The Contractor shall not enter upon nor make use of any private property along the line of work except when written permission is secured from the owner of that property. In case of any damage or injury done along the line of work in consequence of any act or omission on the part of the Contractor, or any one in its employ, in carrying out the contract, the Contractor shall at its own expense restore the same or make repairs as are necessary in consequence thereof in a manner satisfactory to the owner of the affected property; provided, however, that the obligation thus assumed by the Contractor shall not inure directly or indirectly to the benefit of any insurer of physical damage to property or loss of use, rents or profits of property regardless of whether the insurer has actually paid the claim or made only a loan to its insured, nor to the latter if it shall waive or abandon any claim against its insurer or insurers.

In case of failure on the part of the Contractor to restore or repair such property in a manner satisfactory to the owner of the affected property, the party of the first part may upon forty-eight hours notice to the Contractor proceed with such restoration or repair. The expense of such restoration or repair shall be deducted from any monies, which are due or may become due the Contractor under its contract. The Construction Administrator shall be the sole judge as to what constitutes failure to restore or repair as above stated and service of notice by mail addressed to the Contractor at the address stated in the proposal shall be sufficient.

26. CLAIMS FOR DAMAGES

The Contractor agrees that it will make no claim against the County or any of its representatives for damages for delay, interference or disruption of any kind in the performance of its Contract and further agrees that any such claim arising from acts or failure to act of the County or any of its representatives shall be fully and exclusively compensated for by an extension of time to complete the performance of the work as provided herein.

GENERAL CLAUSES

27. EXTENSIONS OF TIME

An extension or extensions of time may be granted only by the Commissioner and only upon a verified application therefore by the Contractor. Each application for an extension of time must set forth in detail the nature of each cause of delay in the completion of the work, the date upon which each such cause of delay began and ended, and the number of days attributable to each of such causes. If the schedule for this project is based upon the Critical Path Method, the Contractor must also demonstrate that the delay for which an extension of time is sought occurred on the critical path. A formal written notice of the Contractor's intent to apply for an extension of time must be submitted to the Commissioner within seven (7) calendar days of the start of the alleged delay. The formal application for the extension of time must be submitted to the Commissioner no later than ten (10) calendar days after the end of the delay, but in no event later than the Contractor's submittal of its application for its substantial completion payment. The failure of the Contractor to timely submit either its formal written notice of its intent to apply for an extension of time or the application thereof shall be deemed a waiver of any entitlement to any extension of time.

The Contractor shall be entitled to an extension of time for delay in completion of the work caused solely (1) by the acts or omissions of the County, its officers, agents or employees; or (2) by the acts or omissions of other Contractors on this project; or (3) by supervening conditions entirely beyond the control of either party hereto (such as, but not limited to, Acts of God, excessive inclement weather, war, or any 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).

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 Engineer or Commissioner. If one of multiple causes of delay operating concurrently results from any act or omission of the Contractor or of its subcontractors of whatever tier, and would of itself (irrespective of concurrent causes) have delayed the work, no extension of time will be allowed for the period of delay resulting from such act or omission and the Contractor shall re-arrange his Progress Schedule and operations so as to complete the Work within the time set forth in the Contract and minimize the impact of the Work on the other Prime Contractors.

The determination made by the Commissioner or Engineer on an application for an extension of time shall be binding and conclusive on the Contractor and may not be challenged except in a proceeding commenced pursuant to Article 78 of the Civil Practice Law and Rules.

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 not operate as waiver on the part of the County of any of its rights or remedies under this contract nor shall it relieve the Contractor from his obligation under the Contract, including without limitations its liability to the County for liquidated damages, engineering costs, delays, damages, and/or costs incurred by the County.

If the Commissioner deems it advisable and expedient to have the Contractor complete and furnish the Work after the expiration of the time of Completion of Work (see "Required

GENERAL CLAUSES

Time For Completion Of The Work” of the General Requirements) and in order that the County’s fiscal officers may be permitted to make payment to the Contractor for Work performed beyond that date, the Commissioner may extend the Contract solely for the purpose of enabling the Contractor to be paid for Work performed. This extension shall in no way relieve the Contractor from his obligation under the Contract, including without limitations its liability to the County for liquidated damages, engineering costs, delays, damages, attorney’s fees and/or costs incurred by the County, nor shall such extension of time be asserted by the Contractor in any action or proceeding as evidence that it completed its work in a timely manner.

The time necessary for review by the Engineer of all submittals including vendors, shop drawings, substitutions, etc., and delays incurred by normal seasonal and weather conditions should be anticipated and is neither compensatory nor eligible for Extensions of Time.

When the Work embraced in the Contract is not completed on or before the date specified herein, engineering and inspection expenses incurred by the County of Westchester upon the Work from the completion date originally fixed in the Contract to the final date of completion of the Work may be charged to the Contract and be deducted from the final monies due the Contractor.

28. REQUEST FOR APPROVAL OF EQUAL

A. GENERAL REQUIREMENTS

Wherever in the Contract Documents an article, material, apparatus, product or process is called for by trade name or catalog reference, or by the name of the patentee, manufacturer or dealer, it is understood that it constitutes the standard requirement to meet the contract specifications. Where two or more articles, materials, apparatus, products or processes are listed as acceptable by reference to trade name or otherwise, the choice of these will be optional to the bidder.

Bidders may base their bid on one of the specified items, or they may base their bid on an “equal”. However, the bidder should be aware that the County makes the final determination as to what constitutes an equal.

If the Engineer shall reject the proposed equal as not being the equal of that specifically named in the contract, the successful bidder (Contractor) shall immediately proceed to furnish the designated article, material, apparatus, product or process as specified or an approved equal without additional cost or time delay to the County.

B. REVIEW PROCESS

- 1) Within fifteen (15) days from the Notice to Proceed, requests for approval of equals must be proposed to the Commissioner on the “Request For Approval Of Equal” form of the Sample Forms. This Period for submitting requests will be strictly enforced. Such requests shall conform to the requirements of this Article.
- 2) Requests for approval of equals will be received and considered from Prime Contractors only and not from manufacturers, suppliers, Subcontractors, or other third parties.
- 3) If the materials and equipment submitted are offered as equals to the Contract

GENERAL CLAUSES

Documents the Contractor shall advise the County and the Engineer of the requested equal and comply with the requirements hereinafter specified in this Article.

- 4) Where the acceptability of an equal is conditioned upon a record of satisfactory operation and the proposed equal does not fulfill this requirement, the Engineer, at his/her sole discretion, may accept the equal if the Contractor provides a bond or cash deposit which guarantees replacement at no cost to the County for any failure occurring within the specified time. The equal item must meet all other technical requirements contained in the Specification.
- 5) The successful bidder shall furnish such information as required by the Engineer to demonstrate that the equal article, material, apparatus, product or process is the equal of that specified in quality, finish, design, efficiency and durability and has been elsewhere demonstrated to be equally serviceable for the purpose for which it is intended. The Contractor shall set forth the reasons for desiring to utilize the proposed equal.
- 6) Contractor shall submit:
 - a. For each proposed request for approved equal sufficient details, complete descriptive literature and performance data together with samples of the materials, where feasible, to enable the Engineer to determine if the proposed request for approved equal is equal, including manufacturer's brand or trade names, model numbers, description of specification of item, performance data, test reports, samples, history of service, and other data as applicable.
 - b. Certified tests, where applicable, by an independent laboratory attesting that the proposed equal is equal.
 - c. A list of installations where the proposed equal equipment or materials is performing under similar conditions as specified.
- 7) Requests for approval of equal after the period set forth in B. REVIEW PROCESS, Paragraph 1, above will not be accepted for evaluation except in case of strikes, discontinuance of manufacturer or other reason deemed valid by the Engineer whereby the specified products or those approved are unattainable. In such case the Contractor shall provide substantial proof that the acceptable products are unavailable.
- 8) Where the approval of an equal requires revision or redesign of any part of Work, including that of other Contracts, all such revision and redesign, and all new drawings and details required therefore, shall be provided by the Contractor at its own cost and expense, and shall be subject to the approval of the Commissioner.
- 9) In the event that the Engineer is required to provide additional engineering services, then the engineer's charges for such additional services shall be promptly paid by the Contractor to the County.
- 10) Any modifications in the Work required under other Contracts to accommodate the changed design will be incorporated in the appropriate Contracts and any resulting increases in Contract prices will be paid by the Contractor who initiated the

GENERAL CLAUSES

changed design to the County.

- 11) In all cases the Engineer shall be the judge as to whether a proposed equal is to be approved. The Contractor shall abide by his/her decision when proposed equal items are judged to be unacceptable and shall in such instances furnish the item specified or indicated. No equal items shall be used in the Work without written approval of the Engineer.
- 12) In making request for approval of equal, Contractor represents that:
 - a. Contractor has investigated proposed equal, and determined that it is equal to or superior in all respects to the product, manufacturer or method specified.
 - b. Contractor will provide the same or better warranties or bonds for proposed equal as for product, manufacturer or method specified.
 - c. Contractor waives all claims for additional costs or extension of time related to proposed equal that subsequently may become apparent.
 - d. Contractor shall have and make no claim for an extension of time or for damages by reason of the time taken by the Engineer in considering an equal proposed by the Contractor or by reason of refusal of the Engineer to approve an equal proposed by the Contractor. Any delays arising out of consideration, approval, or utilization of an equal shall be the sole responsibility of the Contractor requesting the equal and it shall arrange its operations to make up the time lost.
- 13) Proposed Equal Will Not Be Accepted If:
 - a. Acceptance will require substantial revision of Contract Documents.
 - b. They will change design concepts or Technical Specifications.
 - c. They will delay completion of the Work, or the Work of other Contractors.
 - d. They are indicated or implied on a Shop Drawing and are not accompanied by a formal request for approval of equal from Contractor.
- 14) Only those products originally specified and/or added by approved requests for equals submitted in accordance with the preceding paragraphs may be used in the Work. Whenever requests for equals are approved, it shall be understood that such approval is conditional upon strict conformance with all requirements of the Contract and further subject to the following:
 - a. Any material or article submitted for approval in accordance with the above procedure must be equal, in the sole opinion of the Engineer, to the material or article specified. It must be readily available in sufficient quantity to prevent delay of any Work; it must be available in an equivalent color, texture, dimension, gauge, type and finish as to the item or article specified; it must be equal to the specified item in strength, durability, efficiency, serviceability, compatibility with existing systems, ease and cost of maintenance; it must be compatible with the design and not necessitate substantial design modifications; it must be equal in warranties and guarantees; its use must not impose substantial additional Work, or require substantial changes in the Work of any

GENERAL CLAUSES

- other Contractor. Availability of spare parts shall be assured for the useful life of the Project.
- b. The Engineer reserves the right to disapprove, for aesthetic reasons, any material or equipment on the basis of design or color considerations alone, without prejudice to the quality of the material or equipment, if the manufacturer cannot meet the required colors or design.
 - c. All requests for approval of equals of materials or other changes from the contract requirements shall be accompanied by an itemized list of all other items affected. The Engineer shall have the right, if such is not done, to rescind any approvals for equals or changes and to order such Work removed and replaced with Work conforming to the specified requirements of the contract, all at the Contractor's expense, or to assess all additional costs resulting from the equal to the Contractor.
- 15) Approval of an equal will not relieve Contractor from the requirement to submit Shop Drawings or any of the provisions of the Contract Documents.
- 16) In the event that the Engineer is required to provide additional engineering services as a result of a request for approval of an equal of materials or equipment which are not "or equal" by the Contractor, or changes by the Contractor in dimension, weight, power requirements, etc., of the equipment and accessories furnished, or as a result of Contractor's errors, omissions or failure to conform to the requirements of the Contract Documents or if the Engineer is required to examine and evaluate any changes proposed by the Contractor solely for the convenience of the Contractor, or for evaluation of deviations from Contract Documents, then the Engineer's charges in connection with such additional services shall be paid by the Contractor to the County.
- 17) The Contractor shall respond to required submittals with complete information and with a degree of accuracy to achieve approvals within three (3) submissions. All costs to the Engineer involved with subsequent submissions requiring approval, will be paid by the Contractor to the County.

29. SUBSTITUTION

- A. Should the Contractor desire to substitute other articles, materials, apparatus, products or processes than those specified or approved as equal, the Contractor shall apply to the Engineer in writing for approval of such substitution. It should be noted that the bid shall not be based on a substituted article, material, apparatus, product or process. With the application shall be furnished such information as required by the Engineer to demonstrate that the article, material, apparatus, product or process he wishes to use is the equivalent of that specified in quality, finish, design, efficiency and durability and has been elsewhere demonstrated to be equally serviceable for the purpose for which it is intended. The Contractor shall set forth the reasons for desiring to make the substitution and shall further state what difference, if any, will be made in the construction schedule and the contract price for such substitution should it be accepted; it being the intent hereunder that any savings shall accrue to the benefit of the County.

GENERAL CLAUSES

- B. If the Engineer shall reject any such desired substitution as not being the equivalent of that specifically named in the contract, or if it shall determine that the adjustment in price in favor of the County is insufficient, the Contractor shall immediately proceed to furnish the designated article, material, apparatus, product or process.
- C. Request for substitutes must be proposed to the Commissioner on the "Request For Approval Of Substitution" form of the Sample Forms. Such requests shall conform to the requirements of this Article.
- D. Requests for substitutions shall include full information concerning differences in cost, and any savings in cost resulting from such substitutions shall be passed on to the County.
- E. Requests for utilization of substitutes will be reviewed during the course of the project. The impact on the project and the timeliness of submission will be of key consideration.
- F. The approval of utilization of a substitute is subject to the sole and final discretion of the Engineer.
- G. REVIEW PROCESS
 - 1) Requests for approval of substitutions will be received and considered from Prime Contractors only and not from manufacturers, suppliers, Subcontractors, or other third parties.
 - 2) If the materials and equipment submitted are offered as substitutions to the Contract Documents or approved equal the Contractor shall advise the County and the Engineer of the requested substitutions and comply with the requirements hereinafter specified in this Article.
 - 3) Where the acceptability of substitution is conditioned upon a record of satisfactory operation and the proposed substitution does not fulfill this requirement, the Engineer, at his/her sole discretion, may accept the substitution if the Contractor provides a bond or cash deposit which guarantees replacement at no cost to the County for any failure occurring within the specified time. The substitution item must meet all other technical requirements contained in the Specification.
 - 4) The Contractor shall furnish such information as required by the Engineer to demonstrate that the equal article, material, apparatus, product or process is the equivalent of that specified in quality, finish, design, efficiency and durability and has been elsewhere demonstrated to be equally serviceable for the purpose for which it is intended and/or that it offers substantial benefits to the County in saving of time and/or cost. The Contractor shall set forth the reasons for desiring to make this substitution.
 - 5) Contractor shall submit:
 - a. For each proposed request for approved substitute sufficient details, complete descriptive literature and performance data together with samples of the materials, where feasible, to enable the Engineer to determine if the proposed request for approval should be granted, including manufacturer's brand or trade names, model numbers, description of specification of item, performance data, test reports, samples, history of service, and other data as applicable.

GENERAL CLAUSES

- b. Certified tests, where applicable, by an independent laboratory attesting to the performance of the substitute.
 - c. A list of installations where the proposed substitute equipment or materials is performing under similar conditions as specified.
- 6) Where the approval of a substitute requires revision or redesign of any part of Work, including that of other Contracts, all such revision and redesign, and all new drawings and details required therefore, shall be provided by the Contractor at its own cost and expense, and shall be subject to the approval of the Engineer.
- 7) In the event that the Engineer is required to provide additional engineering services, then the engineer's charges for such additional services shall be paid by the Contractor to the County.
- 8) Any modifications in the Work required under other contracts to accommodate the changed design will be incorporated in the appropriate contracts and any resulting increases in contract prices will be charged to the Contractor by the County who initiated the changed design.
- 9) In all cases the Engineer shall be the judge as to whether a proposed substitute is to be approved. The Contractor shall be bound by his/her decision. No substitute items shall be used in the Work without written approval of the Engineer.
- 10) In making request for approval of substitute, Contractor represents that:
- a. Contractor has investigated proposed substitute, and determined that it is equal to or superior in all respects to the product, manufacturer or method specified or offers other specified advantages to the County.
 - b. Contractor will provide the same or better warranties or bonds for proposed substitute as for product, manufacturer or method specified.
 - c. Contractor waives all claims for additional costs or extension of time related to proposed substitute that subsequently may become apparent.
 - d. Contractor shall have and make no claim for an extension of time or for damages by reason of the time taken by the Engineer in considering a substitute proposed by the Contractor or by reason of failure of the Engineer to approve a substitute proposed by the Contractor. Any delays arising out of consideration, approval, or utilization of a substitute shall be the sole responsibility of the Contractor requesting the substitute and it shall arrange its operations to make up the time lost.
- 11) Proposed substitute will not be accepted if:
- a. Acceptance will require substantial revision of Contract Documents.
 - b. They will substantially change design concepts or Technical Specifications.
 - c. They will delay completion of the Work, or the Work of other Contractors.
 - d. They are indicated or implied on a Shop Drawing and are not accompanied by a formal request for approval of substitute from Contractor.
- 12) The Engineer reserves the right to disapprove, for aesthetic reasons, any material or

GENERAL CLAUSES

equipment on the basis of design or color considerations alone, without prejudice to the quality of the material or equipment, if the manufacturer cannot meet the required colors or design.

- 13) All requests for approval of substitutes of materials or other changes from the contract requirements, shall be accompanied by an itemized list of all other items affected by such substitution or change. The Engineer shall have the right, if such is not done, to rescind any approvals for substitutions and to order such Work removed and replaced with Work conforming to the specified requirements of the contract, all at the Contractor's expense, or to assess all additional costs resulting from the substitution to the Contractor.
- 14) Approval of a substitute will not relieve Contractor from the requirement to submit Shop Drawings or any of the provisions of the Contract Documents.
- 15) In the event that the Engineer is required to provide additional engineering services as a result of a request for approval of a substitute results in changes by the Contractor in dimension, weight, power requirements, etc., of the equipment and accessories furnished, or as a result of Contractor's errors, omissions or failure to conform to the requirements of the Contract Documents or if the Engineer is required to examine and evaluate any changes proposed by the Contractor solely for the convenience of the Contractor, or for evaluation of deviations from Contract Documents, then the Engineer's charges in connection with such additional services shall be paid by the Contractor.
- 16) Structural design shown on the Drawing is based upon the configuration of and maximum loading for major items of equipment as indicated on the Drawings and as specified. If the substituted equipment furnished differs from said features, the Contractor shall pay to the County all costs of redesign and for any construction changes required to accommodate the equipment furnished, including the Engineer's charges in connection therewith.
- 17) The Contractor shall respond to required submittals with complete information and with a degree of accuracy to achieve approvals within two (2) submissions. All costs to the Engineer involved with subsequent submissions of Shop Drawings, Samples or other items requiring approval, will be paid by the Contractor to the County, by deducting such costs from payments due for Work completed. In the event an approved item is requested by the Contractor to be changed or substituted for, all costs involved in the reviewing and approval process will likewise be backcharged to the Contractor unless determined by the Engineer that the need for such substitution and/or deviation from Contract Documents is beyond the control of the Contractor.

30. EXTRA WORK: INCREASED COMPENSATION/DECREASED WORK: CREDIT TO THE OWNER

The Director of Project Management may, at any time, by a written order, and without notice to the sureties, require the performance of Extra Work or require or approve changes in the work, or Decreased Work ("work" to include but not be limited to specified methods of performing work) as he may deem necessary or desirable. The amount of compensation

GENERAL CLAUSES

to be paid to the Contractor for any Extra Work, as so ordered, or credit to the Owner for such decreased work, as so ordered or approved, shall be determined as follows:

- 1) **First:** By such applicable unit prices, if any, as set forth in the Contract; or
- 2) **Second:** If no such prices are so set forth, then by unit prices or by a lump sum, or sums, mutually agreed upon by the Director of Project Management and the Contractor; or
- 3) **Third:** If, in the opinion of the Director of Project Management, the aforesaid unit prices, under "First" above, are not applicable, or if the two parties hereto cannot reach agreement as to new unit prices or a lump sum, or sums, under "Second" above, then by the actual net cost in money to the Contractor of the materials and of the wages of applied labor (including cost of supplements provided and premiums for Workmen's Compensation Insurance, FICA, and Federal and State Unemployment Insurance) required for such Extra Work, plus twenty (20%) percent as compensation for all items of profit and costs or expenses including administration, overhead, superintendence, insurance (other than those specifically noted above) materials used in temporary structures, allowances made by the Contractor to subcontractors, including those made for overhead and profit, additional premiums upon the performance bond of the Contractor and the use of small tools and any and all other costs and expenses not enumerated above, plus such rental for plant and equipment (other than small tools) required and approved for such extra work. Where extra work is performed by a Subcontractor, the twenty percent stipulated above shall be divided between the Contractor and the Subcontractor as per their contractual agreement, or if not defined therein, then as the Contractor sees fit.

Rental rates for any power operated machinery, trucks or equipment, which it may be found necessary to use as in "Third" above, shall be reasonable and shall be based on those prevailing in the area of the County where such work is to be done, and they shall be agreed upon in writing before the work is begun.

In no case shall the rental rates submitted exceed the rates set up in the current edition of "Equipment Watch" plus the cost of fuel and lubricants.

These rates shall include all repairs, fuel, lubricants, applicable taxes, insurance, depreciation, storage and all attachments complete, ready to operate, but excluding operators. Operators shall be paid as stated here in above for labor.

For equipment, which is already on the project, the rental period shall start when ordered to work by the Construction Administrator, and shall continue until ordered to discontinue by him. The minimum payment for any one rental period shall be four hours, unless otherwise agreed upon between the Construction Administrator and the Contractor.

For equipment which has to be brought to the project, specifically for use as in "Third" above, the County will pay all loading and unloading costs, also all transportation costs will not be paid, if the equipment is used for work other than in "Third" above while on the project. The rental period shall begin at the time the equipment has been unloaded on the

GENERAL CLAUSES

project, and shall end on and include the day the order to discontinue the use of the equipment as in "Third" above is given to the Contractor by the Construction Administrator.

The daily rate shall apply for rental periods of four calendar days or less, the weekly rate shall apply for rental periods of more than four and not exceeding twenty-one calendar days, and the monthly rate shall apply for rental periods in excess of twenty-one calendar days. For fractional periods above the full unit rental period (day, week, month) reimbursement shall be proportioned on the basis of the applicable rental period. (Day-8 hrs.; Week-7 calendar days; Month-30 calendar days).

No percentage shall be added to the amounts of equipment rental prices agreed upon, but the price agreed upon shall be the total compensation allowed for the use of such equipment.

The provisions hereof shall not affect the power of the Contractor to act in case of emergency.

31. DISPUTED WORK - NOTICE OF CLAIMS FOR DAMAGES

If the Contractor is of the opinion that any work required, necessitated, or ordered violates or conflicts with or is not required by the terms and provisions of this Contract, it must promptly, within five (5) calendar days after being directed to perform such work, notify the Construction Administrator, in writing, of its contentions with respect thereto and request a final determination thereon. If the Construction Administrator determines that the work in question is contract and not extra work, or that the order complained of is proper, he will direct the Contractor in writing to proceed and the Contractor shall promptly comply. In order, however, to preserve its right to claim compensation for such work or damages resulting from such compliance, the Contractor must, within seven (7) calendar days after receiving notice of the Construction Administrator's determination and direction, notify the Construction Administrator, in writing that the work is being performed or that the determination and direction is being complied with, under protest. Failure of the Contractor to so notify shall be deemed as a waiver of claim for extra compensation or damages therefore.

While the Contractor is performing disputed work or complying with a determination or order under protest in accordance with this Article, in each such case the Contractor shall furnish the Construction Administrator daily with three copies of written statements signed by the Contractor's representatives at the site showing:

- 1) the name of each worker employed on such work or engaged in complying with such determination or order, the number of hours employed thereon, and the character of the work each is doing; and
- 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 order, and from whom purchased or rented.

It is expressly agreed that no dispute over the scope of the Contractor's work or any portion thereof shall cause any delay or interruption to the Contractor's work.

In addition to the foregoing statements, the Contractor shall, upon notice from the Board of Acquisition and Contract, produce for examination by the duly appointed representative of

GENERAL CLAUSES

the Board of Acquisition and Contract, all its books of accounts, bills, invoices, payrolls, subcontracts, time books, daily reports, bank deposit books, bank statements, check books and canceled checks, showing all of its acts and transactions in connection with or relating to or arising by reason of this contract, and submit itself, its agents, servants and employees for examination under oath by any duly appointed representative designated by the Board of Acquisition and Contract to investigate claims made against the County. Unless the aforesaid statements shall be made and filed within the time aforesaid and the aforesaid records submitted for examination and the Contractor, its agents, servants, and employees submit themselves for examination as aforesaid, the County shall be released from all claims arising under, relating to or by reason of this contract, except for the sums certified by the Construction Administrator to be due and agreed that no person has power to waive any of the foregoing provisions, and that in any action against the County to recover any sum in excess of the sums certified by the Construction Administrator to be due under or by reason of this contract, the Contractor must allege in its complaint and prove, at the trial, strict compliance with the provisions of this article.

Before final acceptance of the work by the County, all matters of dispute must be adjusted to the mutual satisfaction of the parties thereto. Determinations and decisions in case any question shall arise, shall constitute a condition precedent to the right of the Contractor to receive the money therefore, until the matter in question has been adjusted.

32. CONTRACTOR'S SUBCONTRACTS AND MATERIAL LISTS

Within fifteen (15) days after execution of the Contract, the successful bidder shall submit to the County for approval a list of the subcontractors, materialmen and materials that he/she plans to use in the performance of the work and statements of the work they are to perform. The format and content of the list shall be in accordance with directives from the Construction Administrator. He/sit shall also submit additional information regarding their qualifications as may be later requested by the County. No part of the work may be sublet until after the Contractor has received the County's approval.

The Contractor shall be fully responsible for all acts and omissions of its subcontractors and persons directly or indirectly employed by them, and the County's approval to sublet parts of the work will in no way relieve the Contractor of any of its obligations under the Contract. All dealings of the Construction Administrator with the subcontractors shall be through the Contractor, subcontractors being recognized by the County only as employees of the Contractor.

By executing the Agreement, the Contractor represents that the Contractor shall insert appropriate clauses in all subcontracts to bind the subcontractors to the Contractor by all applicable provisions of the Contract Documents executed between the Contractor and the County, but this shall not be construed as creating any contractual relationships between subcontractors and the County. Prior to approval of the subcontractors, the County has the right to review and recommend changes in the subcontracts. The County reserves the right to reject any subcontractor proposed by the Contractor if in the reasonable opinion of the County such subcontractor lacks the experience, capability or integrity to perform its subcontract work or is otherwise non-responsible.

GENERAL CLAUSES

By executing the Agreement, the Contractor represents that the Contractor shall insert appropriate clauses in each subcontract that require that if the Contractor is terminated by the County either for default or convenience that at the sole option of the County the subcontract shall automatically attach to the County and the subcontractor shall continue without delay or interruption to fully perform all of the obligations required by its subcontract.

Where the specifications permit the Contractor a choice of different materials or manufactured products, it shall state the choice he has made in making up its bid, with the understanding that all choices must subsequently be approved by the Commissioner, after award of the contract to the successful bidder. If the bidder wishes to propose utilization of materials or manufactured products other than those specified, it shall so state and submit the required information in accordance with Article "Request For Approval Of Equal" of the General Clauses."

33. ASSIGNMENT OF CONTRACT

The Contractor shall not assign, transfer, convey or otherwise dispose of the contract or any part of it or any monies due and payable under the contract, without prior written approval of the County. If such approvals are granted by the County, they shall in no way relieve the Contractor or from any obligations under the terms of this Contract.

All documents assigning the contract or any part of it or any monies due and payable under the contract shall contain a clause stating that all monies to be paid the assignee in accordance with the terms of the Contractor's contract with the County, are subject to a prior lien for services rendered or materials and equipment supplied, in favor of all persons, firms or corporations rendering such services or supplying such materials and equipment.

34. PAYMENT FOR GENERAL PROVISIONS

No direct payment will be made for work done or materials furnished in compliance with the General Provisions of the specifications, unless otherwise noted. All compensation to the Contractor for its performance of the requirements of any general provision shall be considered to have been included in the prices he has bid for the individual items if a unit price contract and/or for a lump sum price if a lump sum contract.

In the event the Contractor fails or refuses to proceed with its work and/or correct or repair deficient or defective work then without prejudice to any and all of the County's other rights and remedies, and upon three (3) days notice to Contractor, the County may perform and/or employ any other person or persons to correct and/or repair any or all such work. All costs incurred by the County pertaining thereto shall be paid forthwith by the Contractor to the County.

35. COSTS INCURRED BY COUNTY

Wherever in these Contract Documents the County is entitled to recover costs from the Contractor or charge the Contractor for the costs incurred for the correction, supervision or for any other reason related to the Contractor's work or arising from the Contractor's failure or refusal to proceed with its work in a timely manner, such costs and/or charges shall be

GENERAL CLAUSES

deemed to include, but not be limited to, the County's costs and fees for inspection(s), engineering, consultant(s) and attorneys.

36. GUARANTEE OF WORK

- A. Except as otherwise specified, all work performed under the Contract shall be guaranteed by the Contractor against defects resulting from the use of inferior materials, equipment or workmanship for one year from the guarantee starting date (which shall be defined as the date of the County's approval of the final Certificate for Payment or the date of actual full occupancy of the building, whichever is earlier). The building, section thereof, or item of equipment, shall be occupied or put into actual use by the Owner only after judged completed by the Construction Administrator and Owner and approved by him as ready for occupancy.
- B. If, within any guarantee period, repairs or changes are required in connection with guaranteed work, which in the opinion of the Construction Administrator or Owner is rendered necessary as a result of the materials, equipment or workmanship which are inferior, defective, or not in accordance with terms of the Contract, the Contractor shall promptly upon receipt of notice from the Construction Administrator or Owner and without expense to the Construction Administrator or Owner:
 - 1) Place in satisfactory condition, in every particular, all of such guaranteed work, correct all defects thereof, and
 - 2) Make good all damages to the building or site, or equipment or contents thereof, and
 - 3) Make good any work or material, or equipment and contents of said building or site disturbed in fulfilling any such guarantee.
- C. In any case where in fulfilling requirements of the Contract or of any guarantee embraced in or required thereby the Contractor disturbs any work, it shall restore such disturbed work to a condition satisfactory to the Construction Administrator.
- D. If the Contractor, after notice, fails to proceed promptly to comply with terms of its guarantee, the Owner may have the defects corrected and the Contractor shall be liable for all expenses incurred.
- E. All special guarantees applicable to definite parts of the work that may be stipulated in the Specifications or other papers forming a part of the Contract shall be subject to the requirements and term of this article.

37. SEPARATE CONTRACTS

- A. Contractor's attention is specifically directed to the fact that, because of the work of other contracts within and adjacent to the limits of this Contract they may not have exclusive occupancy of the territory within or adjacent to the limits of this Contract.
- B. Contractor's attention is further directed to the fact that, during the life of this Contract the owners and operators of Public Utilities may make changes in their facilities. These changes may be made by the Utility employees or by contract within the limit or adjacent to these contracts and may be both temporary and permanent.

GENERAL CLAUSES

- C. Contractor shall be required to cooperate with other contractors and the owners of the various utilities, and to coordinate and arrange the sequence of their work to conform to the progressive operations of the work already under contract and to be put under contract.
- D. Contractor shall be responsible for the coordination of the work of their various subcontractors. Their respective operations shall be arranged and conducted so that delays will be avoided. Where the work of a subcontractor overlaps or dovetails with that of other subcontractors, materials shall be delivered and operations conducted so as to carry on the work continuously in an efficient and workmanlike manner. Delays or oversights on the part of Contractor or its subcontractors or utility owners in getting any or all of their work done in the proper way thereby causing cutting, removing and replacing work already in place, shall not be the basis for claim for extra compensation.
- E. In case of interference between the operations of the utility owners and different Contractors, the Construction Administrator will be the sole judge of the rights of each Contractor and the sequence of work necessary to expedite the completion of the entire project, and in all cases the Construction Administrator's decision shall be accepted as final and may not be challenged except in a proceeding brought pursuant to Article 78 of the Civil Practice Law and Rules.

38. COOPERATION WITH OWNER

Each Contractor shall cooperate with the Owner as to parking of vehicles, availability of storage and working areas and confining of activities and personnel to same. **NO PARKING FOR CONTRACTOR'S EMPLOYEES.**

39. JOB MEETINGS & PROJECT SUPERINTENDANT

- A. An officer of the Contractor, or its project manager or superintendent, who is fluent in English and authorized to make binding decision on behalf of the Contractor shall attend job meetings with the Commissioner and/or the Construction Administrator, and any subcontractors whom the Inspector may designate; for the purpose of discussing expedition, execution and coordination of the work.
- B. Job meetings will be scheduled periodically (the first to be prior to commencement of construction) at a time and place designated by the Construction Administrator.
- C. The Contractor shall not commence any work prior to the first (pre-construction) meeting between the Contractor, Commissioner and/or Construction Administrator, client, and other concerned governmental and utility company representatives.
- D. At the pre-construction meeting, the scheduling of the work on an arrow-flow diagram (showing chronologically and in detail the sequence and methods that will be followed) will be provided, and details for the proper execution and special requirements of the work will be explained and discussed.
- E. The Contractor shall be responsible for providing a detailed construction schedule that provides for a Critical Path Method ("CPM") and which is compatible with any of the state of the art CPM Method scheduling software.

GENERAL CLAUSES

F. Updated coordinated arrow-flow diagrams or CPM schedules, as the case may be, will be provided by the Contractor, as above, on a monthly basis to the County.

The Contractor shall indicate on the construction schedules noted above, time for shop drawing preparation, approvals, fabrication and delivery of materials and equipment for major items. The County may request that additional important items be included on the schedule.

G. The Contractors shall ensure that its Project Superintendent shall be on site full time at all times when the Contractor's Work is being performed.

40. PATENT WARRANTY

A. Contractor expressly represents, warrants and agrees that he has the legal right to furnish and install and to authorize the County to purchase and use the equipment hereby offered and each and every one of its several parts and every feature thereof, under one or the other, or partly under one and partly under the other of the following representations.

- 1) That the Contractor possesses a valid patent(s) covering the equipment to be furnished hereunder or part or features thereof or has or will obtain permit(s) and license(s) authorizing the Contractor to furnish and install same and to authorize the purchase and use thereof by the County.
- 2) The Contractor is responsible before ordering material, equipment, parts, systems, etc, to verify that the suppliers of all such material, equipment, parts, systems, etc, will supply the required warranty, guarantee, O & P manual, and maintenance service schedule.
- 3) That the equipment offered or certain parts or features thereof are not covered by any valid patent(s) within the knowledge of the Contractor.

B. Contractor further warrants and agrees that if any patent(s) is hereafter issued to any person whatsoever with respect to the equipment or any part or features thereof, to be furnished and installed hereunder, the Contractor will obtain such permit(s) or license(s) from the Patentee as may be necessary to authorize the use of the equipment by the County.

C. Contractor further represents, warrants and agrees that he and its sureties shall hold themselves responsible for and defend any claims made against the County for any infringement of patents due to the purchase and use by the County of said equipment or any part or feature thereof; that they will indemnify and save harmless the County from all costs, expenses and damages which it shall be obliged to pay by reason of any such infringement of patent(s); that in case the use of any such equipment is enjoined, they will bear the expenses of removing same and replacing same with equipment which will satisfactorily perform the function without constituting an infringement of any patent(s); and in case the use of any equipment shall be enjoined, that they shall pay to the County the sum of \$1,000.00 per day, as liquidated damages, for each and every day during which the County shall be enjoined from using the same up to the day on which such

GENERAL CLAUSES

equipment is replaced by other equipment which will satisfactorily perform the same function but which will not constitute an infringement of any other patent(s).

- D. The Contractor further agrees in the event the use of any of the equipment is enjoined and the Contractor is unable within a reasonable time to devise other equipment which will satisfactorily perform the same functions without infringement on any patent(s), that he will remove the equipment and refund to the County the entire cost of its purchase and installation, plus the sum of \$ 1,000.00 per day as liquidated damages for each and every day until the substitute equipment has been purchased and installed by the County, excepting however that such period shall not exceed three months.
- E. The Contractor further agrees in the event that any claim or notice of claim for infringement of patent(s) are made or filed prior to the making of payment by the County for the equipment and/or material proposed to be furnished and installed hereunder, that the County may withhold any sum due to the Contractor for such equipment and/or material until such claims shall have been settled or adjudicated or until additional surety bonds or other guarantees of indemnification shall have been posted, if deemed necessary by the County for its protection.

41. MATERIALS

A. Quality

- 1) It is the intent of these Specifications to describe definitely and fully the character of materials and workmanship required with regard to all ordinary conditions of the work and to require first-class work and new and best quality materials in all particulars. For unexpected conditions arising during the progress of the work and not fully covered herein, the Specifications shall be interpreted by the Construction Administrator to require first-class work and materials and such interpretations shall be accepted by the Contractor.
- 2) The Contractor is responsible before ordering material, equipment, parts, systems, etc, to verify that the suppliers of all such material, equipment, parts, systems, etc, will supply the required warranty, guarantee, O & P manual, and maintenance service schedule.
- 3) Where materials or devices are specified in these documents by reference to government, manufacturer's association, or professional society standards, the pertinent sections of the latest edition of such standards shall have the same force and effect as if set forth in full in these Specifications. The following abbreviations shall be used as indicated for the principal societies:

AASHO	American Association of State Highway Officials
ACI	American Concrete Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute

GENERAL CLAUSES

ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
AWI	American Woodworking Institute
AWS	American Welding Society
BHMA	Builders Hardware Manufacturers Association
CS	Commercial Standards
FS	Federal Specifications
IEEE	Institute of Electrical and Electronic Engineers
NEC	National Electric Code
NEMA	National Electrical Manufacturer's Association
NFPA	National Fire Protection Association
SDI	Steel Deck Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association, Incorporated
TCA	Tile Council of America, Incorporated
TMCA	Tile and Marble Contractors of America
UL	Underwriter's Laboratories, Incorporated

B. Delivery, Storage and Handling:

- 1) Materials shall be delivered in manufacturer's original sealed containers with complete identification of contents and manufacturer, and kept sealed in original containers until used. Labels shall not be removed until materials have been installed and inspected.
- 2) Materials shall be delivered, stored, and handled with proper equipment and in a manner to protect them from damage.
- 3) The Contractor shall make arrangements for the receipt of materials delivered to the construction site. No representative of the County will accept any materials ordered by the Contractor.
- 4) Finish materials shall be protected from dirt and damage, and perishable materials shall be stored within appropriate weatherproof enclosures.
- 5) Delivery of materials shall be coordinated with the Operations Schedule.
- 6) The Contractor shall confine the apparatus, the storage of materials and the operations of the workmen to the limits indicated by law, ordinances, permits, or directions of the Construction Administrator, and shall not encumber the premises beyond the contract limits.

GENERAL CLAUSES

- 7) The Contractor shall not load or permit any part of the structure to be loaded with a weight that will endanger its safety.
- 8) Whenever the Contract Documents require delivery by the Contractor of any materials, equipment, or other items, the term delivery shall be deemed to include unloading and storing with proper protection where directed.

C. Federal Regulations

- 1) Should the Federal Government, because of Declaration of an Emergency, or other cause, establish controls over the use of certain construction materials, then the Contractor, immediately after signing the Contract or immediately after Declaration of an Emergency, shall furnish the Commissioner with an itemized list of all critical materials required for use on the project. For each item, the quantity required and the approximate date on which delivery will be required shall be indicated.

D. Name Plates

- 1) Each piece of operable equipment to be furnished and installed by a Contractor under its Contract such as motors, pumps, heaters, fans, transformers, switch and fuse racks and other similar equipment shall be provided with a substantial name plate of non-corrodible metal securely fastened in place and clearly and permanently inscribed with the manufacturer's name, the model or type designation, the serial number, the principal rated capacities, the electrical or other power characteristics and other similar and appropriate information.
- 2) Manufacturer's identification shall be inconspicuous, but where nameplates contain information relative to characteristics or maintenance, they shall be clearly visible and located for easy access.
- 3) The nameplate of a subcontractor or a distributor will not be permitted.

E. Manufacturer's Certification

- 1) Prior to the delivery of any water or sewer pipe to the construction site, the Contractor shall furnish properly attested documents certifying as to the type, class, name of manufacturer and source of supply of the pipe. One copy of each document shall be forwarded to the Construction Administrator at the construction site and to the Director of Project Management care of the Engineering Division, Michaelian Office Building, White Plains, New York.

F. Samples

- 1) The Contractor shall furnish, for approval of the Engineer, any samples required by the specifications or that may be requested by the Owner, of all materials he proposes to use, and shall pay all shipping charges for the samples. The Contractor shall send all samples to the office of the Engineer, except when directed otherwise. The sample of approved material will remain on file in the Engineer's office. A disapproved sample will be returned to the Contractor.
- 2) No samples are to be submitted with bids.
- 3) No materials or equipment of which samples are required to be submitted for

GENERAL CLAUSES

approval shall be used on the work until such approval has been given by the Engineer or Construction Administrator, save only at the Contractor's risk and expense.

- 4) Each sample shall have a label indicating the material represented, its place of origin and the names of the producer, the Contractor and the Contract for which the material is intended.
- 5) Approval of any sample shall be only for characteristics or for uses named in such approval, and no other. No approval of a sample shall be taken in itself to change or modify any Contract requirement. When a material has been approved, no additional sample of that material will be considered and no change in brand or make will be permitted. Approved samples held by the Engineer will be returned to the Contractor upon completion of the work, if requested.
- 6) Transactions with manufacturers or subcontractors shall be through the Contractor.

G. Dissimilar Materials

- 1) Where metals are placed in contact with or fastened to dissimilar metals, concrete, masonry, wood or other absorptive materials subject to repeated wetting or wood treated with a preservative non-compatible with the metal or if drainage from dissimilar materials passes over the work; treat the contact surfaces with a heavy coat of approved alkali-resident bituminous paint.
- 2) Where one of the metals is aluminum, a coat of zinc-chromate primer shall be applied prior to the bituminous paint.

42. STANDARD OF QUALITY

Wherever in the contract documents an article, material, apparatus, device, product or process is called for by trade name or catalog reference, or by the name of the patentee, manufacturer or dealer, it shall be construed as establishing a standard of quality and not construed as limiting competition. In such instances, the Contractor may use any article, material, etc. which, in the judgment of the Engineer, expressed in writing, is equal to and acceptable for the intent specified.

43. PROPRIETARY ITEM

Whenever less than three names are used in proprietary item specifications, it has been determined that:

- A. The use of trade names is necessary for effective and workable specifications for the item.
- B. All manufacturers known by the individuals familiar with the trade involved have been listed.
- C. Equal items may be approved in accordance with Article "Request For Approval Of Equal" of the General Clauses.

GENERAL CLAUSES

44. SHOP DRAWINGS

A. Shop Drawing Schedule

- 1) Within fifteen (15) days after the Notice to Proceed, the Contractor shall prepare and submit two (2) copies of its schedule of Shop Drawing submissions to the Engineer for review and approval. The schedule is to be submitted on the “Shop Drawing Schedule” form of the Sample Forms.
- 2) In order to maintain the construction schedule for this project the Contractor shall submit all Shop Drawings per approved schedule. The Contractor is expressly cautioned that its failure or refusal to timely submit a shop drawing schedule acceptable to the Engineer and/or any deviation from the approved shop drawing schedule shall be deemed a default under this Contract.
- 3) Shop Drawings shall be submitted without fail in time to permit correction, resubmission and final approval, as hereinafter specified, without causing any delay in the construction of any Work.
- 4) Samples and Shop Drawings, which are related to the same unit of Work or Specification Section, shall be submitted at the same time. If related Shop Drawings and Samples are submitted at different times, they cannot be reviewed until both are furnished to the Engineer.
- 5) The schedule shall be updated every four-(4) weeks or more frequently as required by the Engineer.
- 6) Two (2)-updated copies of the schedule shall be submitted to the Engineer with each application for Partial Payment.
- 7) Form of Schedule

Schedule shall be in tabular form with appropriate spaces to insert the following information for principal items of equipment and materials:

- a. Date on which Shop Drawings are requested and received from the manufacturer.
- b. Dates on which Shop Drawings are transmitted to the Engineer by the Contractor.
- c. Dates on which Shop Drawings are returned by the Engineer for revisions.
- d. Dates on which Shop Drawings are revised by manufacturer and resubmitted to the Engineer.
- e. Date on which Shop Drawings are returned by Engineer annotated either “Approved” or “Approved as Noted”.
- f. Date on which accepted Shop Drawings are transmitted to manufacturer and Contractor’s Invoice Number.
- g. Date of manufacturer’s scheduled delivery.
- h. Date on which delivery is actually made.

GENERAL CLAUSES

i. Sample of schedule follows on next page.

B. Shop Drawing Requirements

- 1) Shop Drawings for the Work shall include working and setting drawings, schedules, shop details, wiring diagrams, manufacturer's catalog cuts and brochures and all other drawings, schedules and diagrams necessary for the proper correlation of the Work.

Insofar as it is practicable, all drawings shall be uniform in size. They shall be dated, numbered consecutively and shall be identified with the Contract Number and Title, a description of the material or equipment and the area of the work and where it is to be installed. Shop drawings shall accurately and clearly show sizes, work, erection dimensions, arrangement and sectional views, necessary details including information for making connection with the work of other items as may be required, materials and finishes, detailed parts lists, and performance characteristics and capacities as may be required.

- 2) All detailing for structural components shall be done in accordance with the provisions for design and workmanship in the latest additions of the publications listed below except as may be modified in the Contract Documents:

- a. "Manual of Steel Construction" of the American Institute of Steel Construction.
- b. "Building Code Requirements for Reinforced Concrete" and "Manual of Standard Practice for Detailing Reinforced Concrete Structures" of American Concrete Institute.

- 3) Detailing practices for other components shall be done to conform to the best trade practices.

4) Contractor Responsibilities

- a. Before submitting Shop Drawings to the Engineer all submittals from its Subcontractors, manufacturers or suppliers shall be sent directly to the Contractor for preliminary review, coordination and checking.

Contractor shall be responsible for their submission at the proper time so as to prevent delays in delivery of material or equipment. Contractor shall thoroughly check all drawings for accuracy and conformance to the intent of the Contract Documents. Drawings found to be inaccurate or otherwise in error shall be returned to the Subcontractors, manufacturers, or suppliers by the Contractor for correction.

- b. All submittals, including Shop Drawings prepared by or under the direction of the various Contractors, shall be thoroughly checked by the Contractor for accuracy and checked by the Contractor for accuracy and conformance to the intent of the Contract Documents before being submitted to the Engineer and shall bear the Contractor's signature certifying that they have been so checked. Before submitting them to the Engineer, all submittals shall be properly labeled and consecutively numbered. In a clear space above the title block, the Contractor shall provide the "Shop Drawing ID" form of the Sample Forms, and enter the required information:

GENERAL CLAUSES

- c. Shop Drawings shall be submitted as a single package including all associated drawings for any operating system and shall include all items of equipment and any mechanical units involved or necessary for the functioning of such system. Where applicable, the submittal shall include elementary wiring diagrams showing circuit functioning and necessary interconnecting wiring diagrams for construction.
- d. If the submittals contain any departures from the Contract Documents, specific mention thereof shall be made in the Contractor's letter of transmittal. Otherwise, the review of such submittals shall not constitute approval of the departure. The Contractor shall also call the Engineer's attention to any changes by the use of larger letters of at least 1" in height on the Shop Drawings along with a letter by the Contractor advising the Engineer to the recommended change and the reason therefore. If this is not done, even if the Work is incorporated in the construction, it will not be accepted by the Engineer even if Shop Drawings are "Approved".
- e. No materials or equipment shall be ordered, fabricated or shipped or any Work performed until the Engineer returns to the Contractor the submittals herein required, annotated "Approved".
- f. Where errors, deviations, and/or omissions are discovered at a later date in any of the submittals, the Engineer's prior review of the submittals does not relieve the Contractor of the responsibility for correcting all errors, deviations and/or omissions.
- g. Two (2) copies of Preliminary Operations and Maintenance Manuals shall be submitted with the final Shop Drawings for each item of equipment.
- h. Submittals shall be transmitted in strict compliance with Special Clause 10. A.2 and in sufficient time to allow the Engineer adequate time for review and processing so as not to delay the Project per the approved Shop Drawing Schedule.
- i. Contractor shall transmit five (5) prints of each submittal to the Engineer for review. Any submissions, which in the opinion of the Engineer, are not legible will not be reviewed and will be returned to the Contractor annotated "Disapproved".
- j. Contract drawings are for engineering and general arrangement purposes only and are not to be used as Shop Drawings.
- k. Shop Drawings shall accurately and clearly present the following:
 - All working and installation dimensions.
 - Arrangement and sectional views.
 - Units of equipment in the proposed positions for installation, details of required attachments and connections, and dimensioned locations between units and in relation to the structures.
 - Necessary details and information for making connections between the

GENERAL CLAUSES

various trades including, but not limited to, power supplies and interconnecting wiring between units, accessories, appurtenances, etc.

- l. Structural and all other layout drawings prepared specifically for the Project shall have a plan scale of not less than 1/4-inch equal to 1 foot and they shall be not larger than the size of the Contract Drawings.
 - m. Where manufacturer's publications in the form of catalogs, brochures, illustrations, compliance certificates, or other data sheets are submitted in lieu of prepared Shop Drawings, such submissions shall specifically indicate the item for which approval is requested. Identification of items shall be made in ink, and submissions showing only general information are not acceptable.
 - n. The Contractor shall provide all required copies for the use of the various trades and at the Site, and one (1) copy of approved Shop Drawings shall be provided by the Contractor to each of the other Prime Contractors unless otherwise noted in writing by the Engineer.
 - o. The Contractor shall respond to required submittals with complete information and accuracy to achieve required approvals within three (3) submissions. All costs to the Owner involved with subsequent submissions of Shop Drawings, Samples or other items requiring approval, will be backcharged to the Contractor, at the rate of 3.0 times direct technical labor cost, by deducting such costs from payments due for Work completed. In the event an approved item is requested by the Contractor to be changed or substituted, all involved costs in the review process will likewise be paid by the Contractor to the County unless determined by the Director of Project Management or Commissioner that the need for such deviation is beyond the control of the Contractor. Contractor shall be responsible for coordinating its Work and submittals with its Subcontractors.. Should Contractor cause the need for additional submissions or reviews of previous submissions all involved costs will similarly be paid to the County.
- 5) Procedure for Review
- a. Shop Drawings will be checked for design conformance with the Contract Documents and general arrangement only.
 - b. Submittals will be annotated by the Engineer in one of the following ways:
 - "Approved" - no exceptions are taken.
 - "Approved as Noted" - minor corrections are noted and shall be made and a resubmittal is required.
 - "Disapproved because" - with specific deficiencies noted.
 - "Disapproved" - based on the information submitted, the submission is not in conformance with the Contract Documents. The deviations from the Contract Documents are too numerous to list and a completely revised submission of the proposed equipment or a submission of other equipment is required.

GENERAL CLAUSES

- c. One copy of the reviewed submittals will be returned to the Contractor. It is the Contractor's responsibility to provide copies to:
- Its Subcontractors.
 - Its Materialmen and Suppliers.
- unless notified otherwise in writing by the Engineer.
- 6) Disapproved drawings will be returned to the Contractor for correction and resubmission. After the Contractor has had the required corrections made on the original drawing, it shall again submit five copies for review by the Engineer.
- 7) The acceptance of Shop Drawings by the Engineer shall be only general in nature and shall not relieve the Contractor of any responsibility for the accuracy of the drawings, the proper fitting and construction of the Work or for the furnishing of materials or other Work required by the Contract Documents, but not shown on the Shop Drawings. Acceptance of Shop Drawings by the Engineer shall not be construed as approving departures from the Contract requirements unless specifically noted by the Engineer. Acceptance of Shop Drawings for one item shall not be construed as approval for other changes even if noted by the Contractor on the drawing.
- 8) Shop Drawings submitted other than in accordance with the outlined procedures will be returned to the Contractor for resubmission and the Contractor shall bear all expense and risk of all delays as if no Shop Drawings had been submitted.
- 9) No Work shall be performed until the Shop Drawings have been accepted by the Owner, and the Contractor shall be responsible for all costs and damages, which may result from proceeding prior to the approval of the Shop Drawings.

45. SEQUENCE OF CONSTRUCTION OPERATIONS

- A. It is mandatory that the premises continue to be occupied and facilities therein shall continue to function during the performance of the construction work.
- B. Detailed sequence of construction and availability of spaces in areas through which services must pass shall be coordinated between the Owner and the Contractor, before actual commencement of the Work.
- 1) To enable the Work to be laid out and prosecuted in an orderly and expeditious manner, Contractor shall provide a proposed Progress Schedule, within fifteen (15) days after the issuance of the Notice to Proceed of this Contract unless otherwise directed in writing by the Construction Administrator. The proposed Progress Schedule shall show the anticipated time of commencement and completion of each of the various operations to be performed under this Contract; together with all necessary and appropriate information regarding the sequence and correlation of Work; and the Schedule of Shop Drawings and delivery of all materials and equipment required for the Work. The Contractor shall prepare a Master Progress Schedule (Schedule) for the Work. Contractor as directed by the Construction Administrator shall revise the proposed Schedule until each activity is properly sequenced to provide that the Work will be completed in the proper order and

GENERAL CLAUSES

within the allotted Contract duration, without any conflicts. When the Construction Administrator has accepted the Schedule the Contractor will sign it. The Contractor shall then provide one (1) copy of such approved Schedule to each Subcontractor and two (2) copies to the Construction Administrator. Contractor shall afford its Subcontractors a reasonable opportunity for the introduction and storage of their materials and the execution of their Work and shall properly connect and coordinate its Work with others.

Contractor shall strictly adhere to the Schedule unless changed as provided for in the following paragraph.

- 2) Within five (5) days after receiving notice of any change in the Contract, or of any Extra Work to be performed, or of any suspension of the whole or any portion of the Work, or of any other conditions which are likely to cause or are actually causing delays, Contractor must notify the Construction Administrator in writing of the effect, if any, of such change or Extra Work or suspension or other condition upon the previously approved schedule, and must state in what respects, if any, the Schedule should be revised, with the reasons therefor. These proposed changes in the Schedule shall be reviewed and, if appropriate, approved, in writing, by the Construction Administrator. Contractor must strictly adhere to the revised Schedule. Distribution of the revised Schedule shall be as described in paragraph B-1 above. Contractor's compliance with the requirements of this paragraph is in addition to, and not in lieu of, compliance with other notice requirements pertaining to delays and extensions of time contained elsewhere in the contract.
 - 3) The Schedule shall be reviewed by Contractor every two (2) weeks or as directed by the Construction Administrator.
 - 4) If Contractor shall fail to adhere to the approved Schedule, or to the Schedule as revised, they must promptly adopt additional means and methods of construction with no additional cost to the County that will make up for the lost time and will assure completion in accordance with such Schedule. The proposed means and methods shall be described in writing to the County within two (2) days after the Contractor discovered or should have reasonably discovered that the Schedule would not be met as originally proposed. Failure to comply with this requirement may result in the County enforcing its rights under the Contract including, without limitation, default of the Contract.
- C. From time to time as the Work progresses and in the sequence indicated by the approved Schedule, the Contractor must submit to the Construction Administrator a specific request in writing for each item of information or approval required. These requests shall be submitted sufficiently in advance of the date upon which the information or approval is actually required by the Contractor to allow for the time the Construction Administrator may reasonably take to act upon such submissions or resubmissions. The Contractor shall not have any right to an Extension of Time on account of delays due to its failure to timely submit requests for the information or approvals.
- D. Certain construction work shall be required, which will be disruptive to the Owner's staff insofar as noise, dirt and dust is concerned. The Contractor, therefore, shall

GENERAL CLAUSES

perform such work during other than normal working hours. Subject to the requirements of law, the Owner imposes no limitation on the Contractor's working hours and whatever overtime work may be necessary or required shall be considered by the Contractor and reflected in its Bid Proposal without the benefit of extra compensation.

46. PROTECTION

- A. The Contractor shall at all times exercise all necessary precautions for the safety of the public, employees performing the work and County personnel. The Contractor shall provide and maintain barricades, danger signals and other safeguards about the work and shall be held responsible for all accidents or damages to persons or property caused by failure to do so throughout the progress of the work, and shall comply with all applicable provisions of Federal, State and County Safety Laws.
- B. The Contractor shall during the performance of its work, protect at all times all adjacent portions of the existing surfaces and existing equipment from damage due to the performance of the construction work.
- C. The Contractor shall furnish temporary facilities and/or temporary dust-proof partitions separating all work areas and access routes from those areas not involved in active alterations, so that this work will not interfere with the Owner's access or normal use of areas not allocated to the Contractor, or any essential service to such areas, when ordered by the Construction Administrator.

47. CLEANUP AND REMOVAL OF DEBRIS

- A. At the end of each working day, the Contractor shall sweep up and collect all the rubbish and place it in appropriate containers, furnished by the Contractor. Containers shall be kept at a location on, or adjacent to the work site, as designated by the Construction Administrator. Wood or cardboard crates and other debris of a similar nature shall be broken up, securely bundled and neatly stacked alongside the containers. Once each week and at the completion of the work, the Contractor shall remove all accumulated debris and rubbish.
- B. At the completion of the work, the Contractor shall clean all equipment, fixtures, surfaces and accessories, removing all dust and other foreign matter, ready for use by the Owner.

48. TEMPORARY SERVICE

- A. Sanitary facilities will be provided by the Contractor for its personnel.
- B. The Contractor will supply and pay for the cost of all-temporary water and temporary electric power (120 volt, 60 hertz). The Contractor shall furnish and install all temporary electrical and water connections required for work under this Contract, at and to locations as designated by the Construction Administrator.

GENERAL CLAUSES

49. OPERATING TESTS

- A. Where operating tests are specified the Contractor shall test the work as it progresses and shall make satisfactory preliminary tests in all cases before applying to the Engineer for official tests.
- B. Official tests will be made in the manner specified for the different branches of the work, in the presence of the Construction Administrator or Engineer. Should defects appear they shall be corrected by the Contractor and the test repeated until the installation is acceptable to the Construction Administrator or Engineer and to any authorities having jurisdiction.
- C. No work of any kind shall be covered or enclosed before it has been tested and approved.
- D. The Contractor shall furnish all materials and apparatus, make connections and conduct tests, without extra compensation unless noted otherwise.

50. OPERATING INSTRUCTIONS AND PARTS LISTS

- A. Where the Specifications require any Contractor to supply equipment operating and maintenance instructions and spare parts lists prior to the completion of the work it shall provide three copies of the publications for each piece of equipment he has furnished and installed under the Contract, upon receipt of the approved shop drawings.
- B. Publications shall be prepared for the specific equipment furnished and installed, containing the following information, and shall not refer to other sizes, types or models of similar equipment:
 - 1) Clear and concise instructions for the operation, adjustment, lubrication and other maintenance of the equipment, including a complete lubrication chart.
 - 2) A complete listing of all parts for the equipment, with catalog numbers and other data necessary for ordering replacement parts.
- C. Advertising literature will not be acceptable.

51. CUTTING AND PATCHING

Contract with Single Bid:

- A. Where the project does not involve separate bids pursuant to the New York General Municipal Law the following will apply:
 - 1) Where walls, floors, ceilings, roofs or other items require cutting for the installation of new work, all such cutting shall be done by the Contractor with the approval of the Construction Administrator; and the Contractor shall patch the opening to make the cut portions match the adjacent finished surfaces, unless otherwise indicated.
 - 2) The Contractor shall not endanger any existing condition by its operations.
 - 3) The cost of all cutting and patching caused by the Contractor's negligence shall be

GENERAL CLAUSES

borne by the Contractor.

Contract with Separate Bids:

- B. If the project is one where separate bid specifications are required pursuant to the New York General Municipal Law the following will apply:
- 1) A sufficient time in advance of the construction of new floors, walls, ceilings, roofs, or other items, each Contractor shall be responsible for properly locating and providing in place all sleeves, inserts and forms required for their work, and shall furnish the Contractor for General Construction with complete information relative to exact locations and dimensions of all required openings in the General Contractor's work. Other Contractors shall periodically consult the Job Progress Chart of the General Contractor so that they will not be delayed by their work requirements, but the General Contractor shall be obliged to give all other Contractors at least seventy-two hours notice before commencing the previously mentioned new construction work.
 - 2) The cost shall be borne by the responsible Contractor for all cutting, patching, re-waterproofing and re-caulking of new work necessary for reception of the work of a Contractor, caused by the Contractor's failure to timely or properly locate and provide in place all sleeves, inserts and forms required for its own work, or by a Contractor's failure to inform the General Contractor of required openings. The General Contractor shall do all cutting, patching, re-waterproofing and re-caulking of all new work no matter how or by whom such work was caused and shall be reimbursed for such extra work by the responsible Contractor, in accordance with the terms of the Contract. All cutting and patching shall have prior approval of the Construction Administrator.
 - 3) Where sleeves, inserts, forms or openings are required in existing walls, floors, ceilings roofs, or other existing items, all necessary cutting, patching, re-waterproofing and re-caulking required shall be done by the individual responsible Contractor, except for finished surfaces. The responsible Contractor shall do all rough patching to bring the cut areas to the proper surface ready to receive the finished surface. All finishing work required to make the cut portions match the adjacent finished surfaces shall be performed by the General Contractor.
 - 4) Each Contractor shall be responsible for coordinating their work with the work of all other Contractors engaged on the project. If directed, Contractors shall submit coordinated shop drawings showing how the fitting of the various parts of the work will be accomplished, for the Construction Administrator's acceptance.
 - 5) All cutting and patching shall be governed by the applicable divisions of the Specifications with regard to workmanship, materials and methods.
 - 6) No Contractor shall endanger any work by unauthorized cutting, excavating, or other alteration of the work, unless previously authorized by the Construction Administrator.

GENERAL CLAUSES

52. CONFLICTS AMONG CONTRACT DOCUMENTS

In the event of any conflict among the Contract Documents, the Contractor shall notify the Commissioner and comply with the Commissioner's interpretation, according to the following priorities:

<u>Priority Order</u>	<u>Document</u>
1.....	Modification issued after execution of Agreement
2.....	Agreement between Owner and Contractor
3.....	Addenda issued prior to the execution of the Agreement (Later date to take precedence)
4.....	Special Notices
5.....	Technical Specifications
6.....	Construction Drawings:
6A.....	Schedule on Construction Drawings
6B.....	Notes on Construction Drawings
6C.....	Large Scale Details on Construction Drawings
6D.....	Small Scale Details on Construction Drawings
7.....	General Requirements
8.....	Special Clauses
9.....	Information for Bidders and General Clauses

53. RECORD DRAWINGS

- A. The Owner shall furnish, at the first job meeting, one set of "paper" copies of the contract drawing(s) - this is in addition to the five sets of contract drawings as described in the Article "Contract Drawings" of the General Requirements; for the Contractor's use to indicate change(s) as they occur for the duration of the construction work. Upon request from the Contractor, the County will supply the Contractor a copy of the original Contract Drawings in AutoCAD format.
- B. The Contractor shall record neatly and legibly, using reasonable drafting care, all approved change(s) (including minor revisions or corrections of pipes, ducts, electric outlets, circuit panels and other features, as well as invert elevations and locations of underground lines).
- C. When all approved changes are recorded and clearly identified, the Contractor shall prepare a set of "as-built" (record) drawings, in the latest version of AutoCAD, using the approved County format and associated CAD layering guidelines, with 24" x 36" drawing sizes, showing the project as built including all changes in the work made during construction based on marked-up prints, drawings, and other data. These drawings shall be filed on a CD and submitted to the Construction Administrator.
- D. All additional "paper" or reproducible drawings are to be obtained by the Contractor at their own expense.

GENERAL CLAUSES

54. TIME

- A. All time limits (see Article “Required Time For Completion Of The Work” of the General Requirements, and, Article “Time Of Starting” of the Information For Bidders) stated in the specifications are of the essence of the Contract.
- B. The Contractor may perform all necessary labor during other than normal working hours. The Owner imposes no limitation of the Contractor's working hours and whatever overtime work may be necessary or required shall be considered by the Contractor and reflected in its Bid Proposal without the benefit or extra compensation. The Contractor must give a minimum of four (4) hours notice to the Construction Administrator when overtime Work is necessary. The Contractor shall promptly pay to the County the additional cost of the Engineer and Construction Administrator for inspection services during the overtime Work.

55. ACCELERATION OF THE WORK

The Owner may, at its sole discretion and for any reason, require the Contractor to accelerate the schedule of performance by providing overtime, extended day, extra crews, Saturday, Sunday and/or holiday work and/or by having all or any subcontractors designated by the Owner provide overtime, extended day, extra crews, Saturday, Sunday or holiday work by the Contractor’s or his subcontractor’s own forces, and such requirements is independent of and not related in any way to any apparent inability of the Contractor to comply with the schedule(s), Milestone(s) and/or completion date requirements, the Owner, pursuant to a written change order as signed by the Commissioner shall reimburse the Contractor for the direct cost to the Contractor of the premium time for the labor utilized by the Contractor in such overtime, extended day, extra crews, Saturday, Sunday or holiday work (but not for the straight time costs of such labor) together with any social security and state or federal unemployment insurance taxes in connection with such premium time. However, no overhead, supervision costs, commissions, profit or other costs and expenses of any nature whatsoever, including impact costs or costs associated with lost efficiency or productivity, shall be payable in connection therewith. Anything to the foregoing notwithstanding, in the event that the Contractor has fallen behind schedule or in the Owner’s judgment appears likely to fall behind schedule, Owner shall have the absolute right to direct the Contractor to accelerate the performance of its work, including that of its subcontractors, and the full costs for such acceleration shall be borne solely by the Contractor.

56. ULTRA LOW SULFUR DIESEL FUEL

- A. Contractors and Subcontractors operating onroad and nonroad vehicles to perform County work must power those vehicles with ultra low sulfur diesel fuel. Ultra low sulfur diesel fuel is any diesel fuel that has a sulfur content of no more than fifteen parts per million.
- B. In addition, all onroad and nonroad diesel vehicles used to perform County work and equipped with a model year 2003 or older engine shall utilize the best available

GENERAL CLAUSES

technology² in accordance with the following schedule:

- a) effective September 1, 2007 - 35% of all such motor vehicles used on this project;
 - b) effective September 1, 2008 - 65% of all such motor vehicles used on this project;
 - c) effective September 1, 2009 - 100% of all such motor vehicles used on this project.
- C. All onroad and nonroad diesel vehicles to perform County work having a gross vehicle weight rating of more than 14,000 pounds shall utilize the best available technology or be equipped with an engine certified to the applicable 2007 United States Environmental Protection Agency (“EPA”) standard for particulate matter as set forth in Section 86.007-11 of Title 40 of the Code of Federal Regulations or to any subsequent EPA standard for such pollutant that is at least as stringent, in accordance with the following schedule:
- a) by September 1, 2007 - 35% of all such motor vehicles;
 - b) by September 1, 2008 - 65% of all such motor vehicles;
 - c) by September 1, 2009 - 100% of all such motor vehicles
- D. Any contractor who violates any provision of Section 873.1329 shall be liable for a civil penalty not to exceed ten thousand dollars plus twice the amount of money saved by such contractor for failure to comply with this section.
- E. Any contractor who makes a false claim may be liable for a civil penalty not to exceed twenty thousand dollars, in addition to twice the amount of money saved by such contractor as a result of having made such false claim.
- F. Nothing in this section shall be construed to limit the County’s authority to cancel or terminate a contract, deny or withdraw approval to perform a subcontract or provide supplies, issue a non-responsibility finding, issue a non-responsiveness finding, deny a person or entity pre-qualification as a vendor, or otherwise deny a person or entity public entity business.
- G. If sufficient quantities of ultra low sulfur diesel fuel are not available to meet the needs of a contractor to fulfill the requirements of this contract, the Contractor may submit a written request to the Commissioner to use diesel fuel with a sulfur content of no more than thirty parts per million as long as the contractor shall use whatever quantity of ultra low sulfur diesel fuel that is available. Such determination shall be made in writing on a case by case basis upon written application to the Commissioner. If the Commissioner grants such authority it shall expire sixty days thereafter and may be renewed upon written request for additional periods of sixty days.

² Best Available Technology means a system for reducing the emission of pollutants which is based on technology verified by the U.S. Environmental protection Agency or the California Air Resources Board or which has been identified pursuant to NYC’s Department of Environmental Protection that (1) reduces diesel particulate matter emissions by at least 85 percent, as compared to a similar engine operating on traditional diesel fuel without emission control technology, or reduces engine emissions to 0.01 grams diesel particulate matter per brake horsepower per hour or less; and 2) achieves the greatest reduction in emissions of nitrogen oxides at a reasonable cost and in no case produces a net increase in nitrogen oxides in excess of 10%.

GENERAL CLAUSES

H. The Contractor, in order to comply with Subsections B & C above, must retrofit its vehicles to include both of the following in order to comply with the Best Available Technology Requirements:

- Diesel Oxidation Catalysts (DOC)
- Crankcase Vent Filters (CVF)

If the Contractor wants to propose an alternative technology it must submit a written request to the Commissioner with sufficient detail to enable the Commissioner to make a determination as to whether to accept the alternative technology. Any approval of alternative technology must be in writing.

57. QUALIFIED TRANSPORTATION FRINGE PROGRAM (VOID)

58. USE OF FLUORESCENT LIGHT BULBS & ENERGY EFFICIENT BULBS

The use of incandescent light bulbs is prohibited in County-owned buildings and facilities. Only fluorescent light bulbs may be installed in County buildings and facilities. Exterior lights must utilize energy-efficient bulbs. For further details see Article 58 of the General Clauses.

59. COUNTY OF WESTCHESTER PHOSPHORUS-FREE LAWN FERTILIZER POLICY

Executive Order 8-2007 limits the use of lawn fertilizers containing phosphorous and other compounds containing phosphorous, such as phosphate on County owned property.

EXECUTIVE ORDER NO.8 OF 2007

WHEREAS, the New York City water supply watershed is a critical drinking water source for approximately eight million New York City consumers and approximately one million upstate consumers. Over eighty-five percent (85%) of Westchester County's residents consume water from the New York City water supply system; and

WHEREAS, eutrophication is a natural aging process of lakes or streams brought on by

GENERAL CLAUSES

nutrient enrichment. Eutrophication can be greatly accelerated by human activities that increase the rate at which nutrients and organic substances enter aquatic ecosystems from their surrounding watersheds; and

WHEREAS, as a result of accelerated eutrophication, enhanced plant growth reduces dissolved oxygen in the water creating severely impaired water bodies with unpleasant water taste and odor, discoloration, release of toxins and increased turbidity that interferes with the health and diversity of indigenous fish, plant, and animal populations and with the recreational use of rivers, lakes and wetlands. Consequently, eutrophication restricts water use for fisheries, recreation, industry, and drinking due to the increased growth of undesirable algae and aquatic weeds and the oxygen shortages caused by their death and decomposition; and

WHEREAS, nutrient pollution due to human activities is one of the leading causes of eutrophication in the NYC Watershed, and is specifically accelerated by the introduction of excessive phosphorus into the environment. In fact, most reservoirs in the East of Hudson portion of the New York City Watershed (5 of the 7 located in Westchester County) are designated as phosphorous-restricted basins in accordance with the New York City Watershed Rules & Regulations due to excessive phosphorous volumes which have not been reduced despite phosphorous reductions mandated by the New York State Department of Environmental Conservation (NYSDEC); and

WHEREAS, one unnecessary source of phosphorus pollution in the watershed is the many pounds of lawn fertilizer applied by residents and businesses in the County of Westchester each year; and

WHEREAS, when phosphorus fertilizer is applied to phosphorus-rich lawns, much of the excess simply runs off of the lawn into the storm drainage systems where it can be carried into rivers, lakes, streams, and wetlands, causing eutrophication; and

WHEREAS, soil tests conducted pursuant to a six-year study by the Cornell Cooperative Extension, an extension of the State's designated Land-Grant University, have shown that approximately 90% of the lawns in Westchester County have medium-to-high levels of phosphorus; and

WHEREAS, the New York City Watershed Pesticide and Fertilizer Technical Working Group, established by the New York City Watershed Memorandum of Agreement, issued a report in 2000, noting the high percentage of phosphorus in regional soils and recommending that phosphorus-based lawn fertilizers be added only when a soil analysis identifies phosphorus deficiencies.

WHEREAS, the proposed Stormwater Phase II regulations recently issued by the New York State Department of Environmental Conservation, and which are expected to go into effect in January of 2008, will allow the use of phosphorus-based lawn fertilizers on municipally-owned land only where soil testing indicates that phosphorus concentrations are inadequate, in order to ensure that municipalities in the New York City Watershed are

GENERAL CLAUSES

taking satisfactory steps to achieve the above-referenced mandatory phosphorous reductions.

WHEREAS, the United States Environmental Protection Agency has also determined that a Nonpoint Source Implementation Plan was necessary in the Croton Watershed because the phosphorus reductions necessary to meet the targeted applicable water quality standards could not be achieved by wastewater treatment plant upgrades alone; and

WHEREAS, Section 110.11 of the Laws of Westchester County places the responsibility to supervise, direct and control, subject to law, the administrative services and departments of the county, upon the County Executive; and

WHEREAS, I have determined that restricting the application and use of lawn fertilizer containing phosphorus on all County-owned property will address one source of unnecessary and preventable phosphorus pollution and will improve water quality in the County; and

WHEREAS, the Department of Planning, after review of the applicable regulations under the State Environmental Quality Review Act, has advised that this Executive Order has been classified as a Type II action, pursuant to 6 N.Y.C.R.R. § 617.5(c)(20), “routine or continuing agency administration and management, not including new programs or major reordering of priorities that may affect the environment,” and 6 N.Y.C.R.R. § 617.5(c)(27), “adoption of regulations, policies, procedures and local legislative decisions in connection with any action on this list.” As such, no further environmental review is required.

GENERAL CLAUSES

NOW THEREFORE, I, _____, County Executive of the County of Westchester, in light of the aforementioned, do hereby order and direct each and every department, board, agency, and commission of the County of Westchester under my jurisdiction to ensure that the policies and procedures set forth in the following Phosphorus-Free Lawn Fertilizer Policy are complied with.

COUNTY OF WESTCHESTER PHOSPHORUS- FREE LAWN FERTILIZER POLICY

I. Definitions:

(1) "Certified laboratory" means any laboratory certified by the New York State Department of Health pursuant to section five hundred two of the New York State Public Health Law to conduct soil analysis.

(2) "Commercial fertilizer" means any substances containing one or more recognized plant nutrients which is used for its plant nutrient content, and which is designed for use or claimed to have value in promoting plant growth, except unmanipulated animal or vegetable manures, agricultural liming material, wood ashes, gypsum and other products exempted by regulation of the New York State Commissioner of Agriculture and Markets.

(3) "Lawn fertilizer" means a commercial fertilizer distributed primarily for non-farm use, such as lawns, shrubbery, flowers, golf courses, municipal parks, cemeteries, greenhouses and nurseries, and such other use as the commissioner may define by regulation. Lawn fertilizer does not include fertilizer products intended primarily for garden and indoor plant application.

II. Use and Application of Lawn Fertilizer:

(1) Any lawn fertilizer that is labeled as containing more than 0% phosphorus or other compound containing phosphorus, such as phosphate, shall not be applied upon any County-owned property, except as provided in section III. Of this Executive Order.

(2) No lawn fertilizer shall be applied upon County-owned property when the ground is frozen.

(3) Lawn fertilizer shall not be applied to any impervious surface upon County-owned property, including parking lots, roadways, and sidewalks. If such application occurs, the fertilizer must be immediately contained and either applied to turf in a manner consistent with this Executive Order or placed in an appropriate container.

III. Exemptions:

The prohibition against the use of lawn fertilizer under section II of this Executive Order shall not apply to:

GENERAL CLAUSES

(1) Newly established turf or lawn areas during their first growing season.

(2) Turf or lawn areas that soil tests, performed within the past three years by a certified laboratory or by the Cornell University Cooperative Extension of Westchester County, confirm the need for additional phosphorus application in accordance with the phosphorus levels established by the Cornell University Cooperative Extension of Westchester County. The lawn fertilizer application shall not contain an amount of phosphorus exceeding the amount and rate of application recommended in the soil test evaluation.

(3) Agricultural uses, vegetable and flower gardens, or application to trees or shrubs.

IV. The transition to phosphorus-free lawn fertilizer shall occur as soon as possible in a manner that avoids wasting of existing inventories; accommodates establishment of supply chains for new products; enables the training of County employees and licensees in appropriate work methods; and allows the phase-out of products and practices inconsistent with this Executive Order. However, in no event shall lawn fertilizer containing phosphorus (i.e., labeled as containing more than 0% phosphorus or other compound containing phosphorus, such as phosphate) be applied upon County-owned property after January 1, 2009, unless an exemption set forth in Section III of this Executive Order applies.

V. This Executive Order shall take effect on the date hereof, and shall remain in effect until otherwise superseded, repealed, modified or revoked.



SAMPLE FORMS

DEPARTMENT OF PUBLIC WORKS

Division of Engineering

SAMPLE FORMS

AFFIRMATIVE ACTION PROGRAM REQUIREMENT- SUBCONTRACTOR(S)

County of Westchester, Department of Public Works

(To Be Completed By Subcontractor and Submitted with Request to Utilize Subcontractor)

Affirmative Action Program

An approved Affirmative Action Plan shall be required for all Subcontractors for public work where the subcontracted work exceeds \$50,000 or more than fourteen (14) persons are employed by the Subcontractor.

Does the Subcontractor participate in an approved Affirmative Action Program? Yes [] No []

If Yes, give name of Program: _____

If No, how many employees will the Subcontractor employ on this project? _____

An approved Affirmative Action Program shall mean a plan approved or adopted by Westchester County including but not limited to, the Home-Town Plan, the Recruitment Training Program or any other program approved or meeting the requirements of the State or Federal government.

The "Monthly Employment Utilization Report" of the Sample Forms, shall be filled out by the Contractor and/or Subcontractor(s) who are required to have an Affirmative Action Program, prior to the start of the work.

SAMPLE FORMS

CONTRACTOR'S REPORT OF EMPLOYMENT AND WEEKLY AFFIDAVIT

County of Westchester, Department of Public Works

Contract No. _____

Report No. _____

Week(s) ending _____

Title of Contract and Location _____

Contractor or Subcontractor _____

Address _____

STATE OF _____)
COUNTY OF _____) SS.:

I, _____, being duly sworn, depose and say:

1. I pay or supervise the payment of the persons employed by _____
(Contractor or Subcontractor)

in connection with the above referenced contract;

2. During the payment period commencing on the ____ day of _____,
20____ and ending on the _____ day of _____, 20____, all persons employed by
_____ in connection with such contract have been paid in full
(Contractor or Subcontractor)

weekly wages and supplements earned by such persons except the following: (strikeout, if not applicable)

3. Such persons have been paid the prevailing rate of wages and the supplements as determined and required by Section 220 of the New York State Labor Law.

SAMPLE FORMS

4. No rebates or deductions have been deducted from such wages and supplements except as authorized or required by applicable statutes or regulations of the Federal, State and County Governments.

5. The following is a true and accurate summary of wages and supplements paid:

_____ During the week _____ Total to date

Number of names on payroll _____

Hours worked _____

Total wages earned _____

6. I have read the foregoing statement of wages and supplement, know the contents thereof, and the same is true to my own knowledge.

(Signature)

STATE OF NEW YORK)
COUNTY OF WESTCHESTER) ss.:

On this _____ day of _____, 20___, before me personally came _____ to me known, and known to me to be the person who executed the above instrument, and who being duly sworn did say that he executed the same.

Sworn to before me
this _____ day of _____

License No.

Notary Public - State of New York

SAMPLE FORMS

MONTHLY EMPLOYMENT UTILIZATION REPORT
County of Westchester, Department of Public Works

<u>MONTHLY EMPLOYMENT UTILIZATION REPORT</u>										JOB TITLE:		CONTRACT NO.:					
WESTCHESTER COUNTY DEPARTMENT OF PUBLIC WORKS DIVISION OF ENGINEERING										NAME AND LOCATION OF CONTRACTOR:		REPORTING PERIOD: FROM: _____ TO: _____					
CONSTRUCTION TRADE	CLASSIFICATION	TOTAL ALL EMPLOYEES BY TRADE						BLACK (NOT HISPANIC ORIGINAL)	WORK HOURS OF EMPLOYMENT				MINORITY PERCENTAGE %	FEMALE PERCENTAGE %	TOTAL NUMBER OF EMPLOYEES		TOTAL NUMBER OF MINORITY EMPLOYEES
		M	HRS	F	HRS	M	F		M	F	M	F			M	F	
	JOURNEY WORKER																
	APPRENTICE																
	TRAINEE																
	SUB-TOTAL																
	JOURNEY WORKER																
	APPRENTICE																
	TRAINEE																
	SUB-TOTAL																
	JOURNEY WORKER																
	APPRENTICE																
	TRAINEE																
	SUB-TOTAL																
	JOURNEY WORKER																
	APPRENTICE																
	TRAINEE																
	SUB-TOTAL																
	TOTAL JOURNEY WORKER																
	TOTAL APPRENTICES																
	TOTAL TRAINEES																
	GRAND TOTAL (#HRS & #EMPL)																
COMPANY OFFICIAL'S SIGNATURE AND TITLE:										TELEPHONE NUMBER (Include Area Code):				DATE SIGNED:		PAGE: _____ OF _____	

This report must be filled out by all contractors (both prime and sub) who are required to have an Affirmative Action Program, and must be filed with the Engineer by the 5th day of each month during the term of the Contract, and shall include the total work hours of each employee classification in each trade in the covered area for the Monthly Reporting Period. The Prime Contractor shall submit a report for its Aggregate Work Force and collect and submit reports for each subcontractor's Aggregate Work Force to the Engineer.

SAMPLE FORMS

SHOP DRAWING SCHEDULE
County of Westchester, Department of Public Works

SHOP DRAWING SCHEDULE											
SPECIFICATION NUMBER	DESCRIPTION OF ITEM/MODEL #	SUBMISSION	REQUEST FROM CONTRACTOR TO MANUFACTURER	RECEIVED BY CONTRACTOR FROM MANUFACTURER	RECEIVED BY COUNTY FROM CONTRACTOR	RETURNED BY COUNTY TO CONTRACTOR	RETURNED BY CONTRACTOR TO MANUFACTURER	APPROVED BY COUNTY	APPROVED SHOP DRAWING MANAGER FROM CONTRACTOR	INVOICE NO. AND SCHEDULED DELIVERY DATE	ACTUAL DELIVERY DATE
		ORIGINAL									
		2									
		3									
		4									
		ORIGINAL									
		2									
		3									
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		4									
		ORIGINAL									
		2									
		3									
		4									

SAMPLE FORMS

SHOP DRAWING ID

County of Westchester, Department of Public Works

WESTCHESTER COUNTY DRAWING _____ OF _____

NAME OF PROJECT

Date _____

Contract No. _____

Item/Model No. _____

Manufacturer _____

Contract Drawing No. _____

Specification Section _____

This document has been reviewed, coordinated and checked for accuracy of content and for compliance with the Contract Documents. The information contained herein has been coordinated with all other Contract Work.

Contractor _____

Signed _____

SAMPLE FORMS

REQUEST FOR APPROVAL OF EQUAL

County of Westchester, Department of Public Works

SPECIFICATION

NO.

ITEM

EQUAL

Attach a separate sheet here if more space is required.

SAMPLE FORMS

REQUEST FOR APPROVAL OF SUBSTITUTIONS

County of Westchester, Department of Public Works

<u>ITEM NO.</u>	<u>ITEM</u>	<u>SUBSTITUTION</u>	<u>COST OF SPECIFIED ITEM</u>	<u>COST OF SUBSTITUTED ITEM</u>	<u>SAVINGS TO COUNTY</u>

Attach a separate sheet here if more space is required.

SAMPLE FORMS

CONTRACTOR'S ULTRA LOW SULFUR DIESEL FUEL AFFIDAVIT

County of Westchester, Department of Public Works

Contract No. _____ Period Included in this Report: _____, 20__ to _____, 20__

Title of Contract and Location _____

Contractor _____

Address _____

Subcontractor _____

Address _____

STATE OF _____) ss.:
COUNTY OF _____)

I, _____ being duly sworn, depose and say:
(print name) (print title)

1. I certify under penalty of perjury that I agree to comply with the requirements of Chapter 878, Article XIII, Section 873.13.29 of the Laws of Westchester County.
2. During the period _____ through _____, all diesel-powered vehicles, used in the performance of Contract No. _____, were powered by ultra low sulfur diesel fuel (15 ppm Sulfur Maximum).
3. No fuel other than Ultra Low Sulfur Diesel Fuel (15 ppm Sulfur Maximum) was utilized on this project for the above described vehicles.
4. The annexed Ultra Low Sulfur Diesel Fuel Log is a true and accurate summary of the low sulfur diesel fuel (15 ppm Sulfur Maximum) purchased and utilized in the performance of this project.
5. I have read the foregoing statement, have full knowledge of the contents thereof, and it is my intent that the County of Westchester will rely on the statements contained herein.

(Signature)

STATE OF _____) ss.:
COUNTY OF _____)

On this _____ day of _____, 20__, before me personally came _____ to me known, and known to me to be the person who executed the above instrument, and who being duly sworn did say that he/she executed the same.

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

Notary Public

The Ultra Low Sulfur Diesel Fuel-Log must be attached.

This Certification also has to be submitted by your subcontractor(s). *Additional copies of this form can be acquired from the Department of Public Work.*

SAMPLE FORMS

ULTRA LOW SULFUR DIESEL FUEL (15 ppm Sulfur Maximum) – LOG

Period of Log: _____ through _____

Contract No. _____

Title of Contract and Location _____

Contractor or Subcontractor _____

Address _____

Date of Purchase	Name and Address of Vendor (Print)	Gallons Purchased

A Separate Copy of this Certification will also have to be signed by each of your subcontractors that utilize diesel powered vehicles, fifty horsepower or greater, on the above project. Additional copies of this form can be acquired from the Department of Public Works.

- New
 Change
 No Change

Electronic Funds Transfer (EFT) Vendor Direct Payment Authorization Form

INSTRUCTIONS: Please complete both sections of this Authorization form and attach a voided check. See the reverse for more information and instructions (Forms Page 21). If you previously submitted this form and there is no change to the information previously submitted, **ONLY** complete lines 1 through 6 of section 1.

Section I - Vendor Information

1. Vendor Name:												
2. Taxpayer ID Number or Social Security Number:		<table border="1" style="width: 100%; height: 20px;"> <tr> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> </tr> </table>										
3. Vendor Primary Address												
4. Contact Person Name:		Contact Person Telephone Number:										
5. Vendor E-Mail Addresses for Remittance Notification:												
6. Vendor Certification: <i>I have read and understand the Vendor Direct Payment Program and hereby authorize payments to be received by electronic funds transfer into the bank that I designate in Section II. I further understand that in the event that an erroneous electronic payment is sent, Westchester County reserves the right to reverse the electronic payment. In the event that a reversal cannot be implemented, Westchester County will utilize any other lawful means to retrieve payments to which the payee was not entitled.</i>												
_____ Authorized Signature	_____ Print Name/Title	_____ Date										

Section II- Financial Institution Information

7. Bank Name:												
8. Bank Address:												
9. Routing Transit Number:		10. Account Type: (check one)										
<table border="1" style="width: 100%; height: 20px;"> <tr> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> </tr> </table>												<input type="checkbox"/> Checking <input type="checkbox"/> Savings
11. Bank Account Number:		12. Bank Account Title:										
13. Bank Contact Person Name:		Telephone Number:										
14. FINANCIAL INSTITUTION CERTIFICATION (required ONLY if directing funds into a Savings Account OR if a voided check is not attached to this form): <i>I certify that the account number and type of account is maintained in the name of the vendor named above. As a representative of the named financial Institution, I certify that this financial Institution is ACH capable and agrees to receive and deposit payments to the account shown.</i>												
_____ Authorized Signature	_____ Print Name / Title	_____ Date										

(Leave Blank - to be completed by Westchester County) - Vendor number assigned

--	--	--	--	--	--	--	--	--	--

Electronic Funds Transfer (EFT) Vendor Direct Payment Authorization Form

GENERAL INSTRUCTIONS

Please complete both sections of the Vendor Direct Payment Authorization Form and forward the completed form (along with a voided check for the account to which you want your payments credited) to: Westchester County Board of Acquisition and Contract, 148 Martine Ave, Room 104, White Plains, NY 10601, Attention: Vendor Direct. Please see item 14 below regarding attachment of a voided check.

Section I - VENDOR INFORMATION

1. Provide the name of the vendor as it appears on the W-9 form.
2. Enter the vendor's Taxpayer ID number or Social Security Number as it appears on the W-9 form.
3. Enter the vendor's complete primary address (not a P.O. Box).
4. Provide the name and telephone number of the vendor's contact person.
5. Enter the business e-mail address for the remittance notification. THIS IS VERY IMPORTANT. This is the e-mail address that we will use to send you notification and remittance information two days prior to the payment being credited to your bank account. We suggest that you provide a group mailbox (if applicable) for your e-mail address. You may also designate multiple e-mail addresses.
6. Please have an authorized Payee/Company official sign and date the form and include his/her title.

Section II - FINANCIAL INSTITUTION INFORMATION

7. Provide bank's name.
8. Provide the complete address of your bank.
9. Enter your bank's 9 digit routing transit number.
10. Indicate the type of account (check one box only).
11. Enter the vendor's bank account number.
12. Enter the title of the vendor's account.
13. Provide the name and telephone number of your bank contact person.
14. If you are directing your payments to a Savings Account OR you can not attach a voided check for your checking account, this line needs to be completed and signed by an authorized bank official. IF YOU DO ATTACH A VOIDED CHECK FOR A CHECKING ACCOUNT, YOU MAY LEAVE THIS LINE BLANK.



SAMPLE CONTRACT AND BOND
FOR CONSTRUCTION

DEPARTMENT OF PUBLIC WORKS

Division of Engineering

COUNTY OF WESTCHESTER

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

**COUNTY OFFICE BUILDING/ROOM 500
WHITE PLAINS, NEW YORK**

CONTRACT AND BOND

FOR:

CONTRACT

XX-XXX

**XXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXX, NEW YORK**

SAMPLE

**John Nonna
County Attorney**

CONTRACT NO.:

Amount of Contract: \$

THIS AGREEMENT made this **th** day of , **2022**, by and between the **COUNTY OF WESTCHESTER**, a municipal corporation of the State of New York, hereinafter, “County”, and

hereinafter called the “Contractor”, WITNESSETH as follows:

WHEREAS, the Commissioner of Public Works and Transportation, hereinafter called “Commissioner”, by virtue of the power and authority in him vested did advertise for proposals and bids for:

Westchester County, New York, to furnish all labor, tools, implements and materials that may be requisite and necessary to the execution and completion of the work according to the plans, specifications, profiles and other drawings relating to such work, as approved by the County of Westchester and now on file in the Office of the Commissioner, and

WHEREAS, the Contractor did bid for said work in the manner and form as required by said plans and specifications and, being the lowest responsible bidder therefore, was duly awarded the Contract for such work at prices named in the itemized proposal by a resolution of the Board of Acquisition and Contract of the said County of Westchester.

NOW THEREFORE, the Contractor, in consideration of the prices so named for the various items of work to be paid for as hereinafter provided, does for itself, its representatives, agents, executors, administrators, successors or assigns, covenant and agree with the County that it, the said Contractor, shall and will at its own proper costs and charges and in conformity with said plans and specifications which are made a part of this Contract without setting forth same herein, provide all manner and kind of materials, molds, models, cartage, appliances and appurtenances required and of every description necessary for the due and proper performance of this Contract and the completion of said work to be done under the supervision and direction of the Commissioner, in a good workmanlike manner and in conformity with said plans and specifications without any alteration, deviation, additions, or omissions therefrom except upon due request and under the written direction of said Commissioner.

The Contractor acknowledges receipt of the “Information for Bidders, General and Special Clauses, Specification, Proposal and Plans” relating to this Contract, as well as all issued Addenda thereto, all of which are expressly incorporated in this Contract as if fully set forth herein.

IT IS FURTHER UNDERSTOOD AND AGREED by and between the parties to this Contract that if in the opinion of the said Commissioner of the County of Westchester it shall become necessary to make any change in the work called by the plans and specifications which are a part of this Contract, whereby, consistent with the Information for Bidders, the work contemplated by said plans and specifications is modified and reduced and the costs and expenses of such work lessened, that then and in that event the Contractor will do the work as changed and modified and the said Commissioner shall estimate the difference between the original estimate of quantities therefor and the amount that should be paid by reason of the modification and change and the difference shall be deducted from the original estimate of quantities therefore of said Contract and said Contractor shall be paid accordingly. The estimate of said Commissioner shall be final and conclusive upon the parties hereto and may not be challenged except in a proceeding commenced pursuant to Article 78 of the Civil Practice Law and Rules. Any changes, modifications or deductions shall in no way invalidate this Contract and said Contractor agrees that in the event of any such change or modification reducing the original, estimated quantities therefore, it will not make any claim for any profit, or loss of profit by reason thereof. Notwithstanding any dispute or disagreement arising hereunder, Contractor agrees that the Work shall not be delayed nor disrupted by reason thereof.

The County hereby covenants and agrees with the said Contractor, in consideration of the covenants and agreements herein being strictly and in all respects complied with by the said Contractor as specified, that it will well and truly pay unto the said Contractor the unit prices set forth in the Proposal for the various items included in the Contract.

All partial payments will be made in accordance with the provisions set forth in the “Information for Bidders” and especially that part thereof which relates to “Estimates and Payments”.

Furthermore, all partial payments will be made on the claim voucher and verified certificate of the Commissioner, both of which shall be filed in the Office of the Commissioner of Finance of the County of Westchester. The said claim voucher shall show the value of the work completed and the verified certificate shall show the said work was done in accordance with the plans and specifications.

With the final estimate the Contractor shall furnish to the Construction Administrator a sworn statement listing all unpaid bills and liabilities incurred under this Contract up to and including the date of the estimate. Where there are any bills or liabilities in excess of moneys due under any estimate under this Contract, the Construction Administrator may withhold payment of the estimate pending a satisfactory proof of settlement or adjustment of any excess claims. No final estimate will be approved or passed for payment unless and until the Contractor furnishes satisfactory proof that all bills and liabilities incurred under the Contract are paid in full and complies with the requirements of Section 220-a of the Labor Law.

Acceptance shall be effected as follows: whenever, in the opinion of the Commissioner, the Contractor shall have completely performed the Contract on his part to be performed, the Commissioner shall so certify in writing to the Board of Acquisition and Contract of the County and file such certificate with the said Board, stating therein, in substance that the work has been duly examined by him and that the same has been fully performed and completed in accordance with the terms of the Contract therefor, and recommending the acceptance thereof. When the Board of Acquisition and Contract by resolution duly adopts, approves and ratifies, the said acceptance shall be complete. No final payment shall be made under this Contract until such certificate of completion and recommendation of acceptance have been approved and ratified by a resolution of said Board of Acquisition and Contract.

Unless otherwise provided for in the contract documents, 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, that 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 herein. In the event the Commissioner takes over, uses, occupies or operates any part of the work: (i) the Commissioner shall issue a written determination of Substantial Completion with respect to such part of the Work; and (ii) the Contractor shall be relieved of its absolute obligation to protect such part of the unfinished work in accordance with Article 19 of the General Clauses.

The Commissioner will approve a final estimate for final payment consistent with the authorization of final acceptance from the Board of Acquisition and Contract less previous payments and any and all deductions authorized to be made by the Commissioner under the Contract or law. Payment pursuant to such final estimate less any additional deductions authorized to be made by the Commissioner of Finance under the Contract or law shall constitute the final payment and shall be made by the Commissioner of Finance. If the contract is terminated prior to final acceptance the Commissioner is authorized to prepare a final payment as otherwise authorized by the Board of Acquisition and Contract subject to the above noted adjustments.

Upon the completion and acceptance of this Contract by the Board of Acquisition and Contract, as aforesaid, the Commissioner shall proceed with all reasonable diligence to ascertain from actual measurements the whole amount of work done by the Contractor, and also the value of such work under and according to the terms of this Contract, and thereupon make out in writing a final estimate therefor.

After the completion and acceptance as herein above-mentioned, the Commissioner of Public Works and Transportation shall file with the Commissioner of Finance of the County of Westchester the original verified certificate, claim voucher and the certification required by Section 220-a of the Labor Law, together with a certified copy of the resolution of approval and ratification of the Board of Acquisition and Contract of the said verified certificate and claim voucher and the resolution of acceptance of completion.

IT IS FURTHER UNDERSTOOD AND AGREED by and between the parties to this Contract that the Contractor will accept the unit prices named in the proposal for all additions to or deductions from the original quantities as given in the specifications. It is agreed that the Commissioner will make estimates of the value for the work completed as provided in the specifications and the final estimate will be made accordingly.

The Contractor further agrees that if at any time before or within thirty days after the whole of the work herein agreed to be performed has been completed and accepted any person or persons claiming to have performed any labor or furnished any material towards the performance and completion of this contract shall file with the proper officials any such notice as is described in the Lien Law, or any other act of the Legislature of the State of New York, the Contractor shall cause such Lien to be discharged of record. Otherwise and in every case and until the Lien is discharge of record the County shall retain, anything herein to the contrary notwithstanding, from the moneys under its control and due or to grow due under this Contract the sum of one hundred fifty (150%) percent of the amount of such Lien, unless otherwise authorized to withhold a larger amount. The Contractor further agrees to pay the County upon demand the costs, including but not limited to attorney's fees, incurred by the County in any action(s) brought to foreclose or otherwise enforce said Lien.

The term of this Agreement shall commence on **August 25, 2022** and shall terminate on **August 20, 2025**. It is recognized and understood by the parties that the above Agreement termination date is solely for accounting purposes to allow for final closeout of this Agreement. Accordingly, the Contractor covenants and agrees to commence the work embraced in this Agreement on the Agreement commencement date and to complete said work in all respects on or before the work completion date set forth the General Requirements section of this Agreement.

It is further understood and agreed by the parties hereto that the time of completion is of the essence of this Contract.

It is further understood and agreed by the Contractor that before entering upon the performance of this Contract it shall have approved by the County Attorney the Bond required to be furnished by it in the sum of --- **FOUR MILLION ONE HUNDRED FIFTY THOUSAND NINE HUNDRED DOLLARS-00/100--- [\$4,150,900.00]**-conditioned for the faithful performance of the work.

It is further understood and agreed by the Contractor that, in addition to, and not in limitation of the insurance requirements contained in Schedule "A" entitled "Standard Insurance Provisions", attached hereto and made a part hereof, the Contractor agrees:

(a) that except for the amount, if any, of damage contributed to, caused by or resulting from the sole negligence of the County, the Contractor shall indemnify and hold harmless the County, its officers, employees and agents from and against any and all liability, damage, claims, demands, costs, judgments, fees, attorneys' fees or loss arising directly or indirectly out of the acts or omissions hereunder by the Contractor or third parties under the direction or control of the Contractor; and

(b) to provide defense for and defend, at its sole expense, any and all claims, demands or causes of action directly or indirectly arising out of this Agreement and to bear all other costs and expenses related thereto.

(c) In the event the Contractor does not provide the above defense and indemnification to the County, and such refusal or denial to provide the above defense and indemnification is found to be in breach of this provision, then the Contractor shall reimburse the County's reasonable attorney's fees incurred in connection with the defense of any action, and in connection with enforcing this provision of the Agreement.

The Contractor hereby covenants and agrees to observe the plans, specifications and directions of the Commissioner in the doing of the work provided for under this Contract and to furnish the necessary materials and implements required therefore and to remove condemned material and rubbish as provided by plans and specifications and to employ a competent and sufficient force of workmen to complete the work of this improvement within the time specified. Should the Contractor at any time become insolvent, make an assignment for the benefit of creditors, abandon the Work, reduce its working force to a number which, if maintained, would be insufficient, in the sole opinion of the Commissioner, to complete the Work in accordance with the approved progress schedule; sublet, assign or otherwise dispose of this Contract other than as permitted elsewhere herein, refuse or neglect to supply a sufficiency of properly skilled workmen, or of material of the proper quantity or fail in any respect to prosecute the work with promptness and diligence, or fail in any other way in the performance of any of the agreements herein contained; all the foregoing being deemed acts of default, and such default being certified by the Commissioner, the County of Westchester, acting by the Board of Acquisition and Contract, shall be at liberty after five days written notice to the Contractor to provide any such labor or materials, use any and all sums due or to become due to the Contractor under this Contract, to pay for such labor and material, and if the Commissioner shall certify that such default is sufficient ground for such action, the County of Westchester acting by the Board of Acquisition and Contract, shall also be at liberty to terminate the employment of the Contractor for the said work and to enter upon the premises and take possession for the purpose of completing the work included under this Contract of all materials, tools and appliances thereon and to employ any other person or persons to finish the work and provide the materials therefore. Upon the Contractor's receipt of a notice from the County the Contractor shall immediately discontinue all further operations under this Contract. In case of such termination, the Contractor shall not be entitled to receive any further payment under this Contract until the said work shall be wholly finished, at which time if the unpaid balance of the amount to be paid under this Contract shall exceed the reasonable value of the work performed and the material furnished or the total costs therefor, whichever is greater, in finishing the work, such excess shall be paid by the County of Westchester to the Contractor, but if such expense shall exceed such unpaid balance, the Contractor shall pay the difference to the County.

The expense incurred by the County and the total costs as herein provided either for furnishing materials or for finishing the work and any damage incurred through such default shall be certified by the Commissioner whose certificate thereof shall be final and conclusive

upon the parties and may not be challenged except in a proceeding commenced pursuant to Article 78 of the Civil Practice Law and Rules.

In case the County shall declare the Contractor in default as to a part of the work only, the Contractor shall immediately discontinue such part, shall continue performing the remainder of the Work in strict conformity with the terms of the Contract.

In completing the whole or any part of the Work under the provisions of this Contract, the Commissioner shall have the power to depart from or change or vary the terms and provisions of this Contract. 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 certification of the cost of completion referred to above, 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 his default or partial default.

In addition to termination as provided for above, the County may terminate this Contract for the convenience of the County by written notice to the Contractor from the Commissioner. In such event and upon receipt of such notice the Contractor shall stop work on the date specified in the notice; take such actions as may be necessary to protect and preserve the County's materials and property; cancel all cancelable orders for material and equipment; assign to the County and deliver to the jobsite or any other 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 which has been specifically fabricated for the sole purpose of this Contract and not incorporated in the Work; and take no action that will increase the amounts payable by the County under this Contract.

In the event the contract is cancelled for the convenience of the County the following provisions shall apply:

(a) For Work completed prior to the notice of termination, the Contractor shall be paid the fair and reasonable value of its work determined by the pro rata portion of the lump sum bid amount based upon the percent completion of the Work as of the date of termination as determined by the Commissioner, plus work completed pursuant to approved change orders, less amounts previously paid. For purposes of determining the pro rata portion of the lump sum bid amount to which the Contractor is entitled, the Contractor's approved bid breakdown pursuant to Article 21 of the Information for Bidders shall be considered but shall not be dispositive as to the fair and reasonable value.

(b) For non-cancelable material and equipment that is not capable of use except in the performance of this Contract and which has been specifically fabricated for the sole purpose of this Contract, but not yet incorporated in the Work, the Contractor shall be paid the fair and reasonable value thereof as determined by the Commissioner, but not more than the Contractor's cost for such material and equipment, plus an additional sum of two (2%) percent of such fair and reasonable value.

(c) In the event the County terminates a lump sum Contract for convenience within thirty (30) days after the Contractor has received the Notice of Award from the County, the Contractor shall be paid one (1%) percent of 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 (a) and (b).

(d) On all unit price Contracts, or on unit price items in a Contract, the County will pay the Contractor the sum of (e) and (f) below, less all payments previously made pursuant to this Contract:

(e) For all completed units, the unit price stated in the Contract, and

(f) For units that have been ordered but are only partially completed, the Contractor will be paid (i) a pro rata portion of the unit price as stated in the Contract based upon the percent completion of the unit as determined by the Commissioner and (ii) for non-cancelable material and equipment, payment will be made pursuant to (b), above.

(g) The Commissioner's determination(s) hereunder shall be final, binding and conclusive and subject to review only pursuant to Article 78 of the New York Civil Practice Law and Rules.

(h) The County shall not be liable to the Contractor for any payment or claim if the termination for convenience results in a reduction of thirty (30%) percent or less of the original contract price as bid.

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 29 of the General Clauses, less all payments previously made pursuant to this Contract.

In no event shall any payments made pursuant to a termination for convenience exceed the Contract price for such items, either individually or collectively.

All payments made pursuant to a termination for convenience shall be in the nature of liquidated damages and shall be accepted by the Contractor in full satisfaction of all claims against the County.

The County may deduct or set off against any sums due and payable arising from a termination for convenience, any claims it may have against the Contractor.

In the event the County terminates the Contractor for default and it is subsequently determined that the Contractor was not in default, said termination shall automatically be converted for all purposes into a termination for convenience.

It is further understood and agreed between the parties hereto that no certificate given or payment made under this Contract, except the final certificate or final payment shall be conclusive evidence of the performance of this Contract either wholly or in part and that no payment shall be construed to be an acceptance of defective work or improper materials. If the Contractor shall fail to replace any defective work or materials, the County may cause such defective materials to be removed and defective work to be replaced and the expense thereof shall be deducted from the amount to be paid the Contractor.

Anything to the contrary in the preceding paragraph notwithstanding, the Contractor is responsible for the repair of defects in materials and workmanship for a period of one year from the date of final acceptance of the work by the Board of Acquisition and Contract, unless a longer term is specified in the specifications.

The Contractor further agrees not to assign, transfer, convey, sublet or otherwise dispose of this Contract, or its right, title or interest in or to the same, or any part hereof without the previous consent in writing of the Board of Acquisition and Contract of the County. Before a Subcontractor shall proceed with any work, the Commissioner must first recommend and the Board of Acquisition and Contract must approve the use of the Subcontractor on this Contract. If a Subcontractor is not approved it may not work on this Contract. The Contractor specifically waives any claim due to the failure or refusal of the Commissioner or the Board of Acquisition and Contract to approve said Subcontractor.

The Contractor agrees to hold himself responsible for any claims made against the County for any infringement of patents by the use of patented articles in the construction and completion of the work or any process connected with the work agreed to be performed under this Contract or of any material used upon the said work, and shall indemnify and save harmless the County for the costs, expenses and damages which the County may be obligated to pay by reason of any infringement of patents used in the construction and completion of the work.

The parties hereto agree that no laborer, workman or mechanic in the employ of the Contractor, Subcontractor or other person doing or contracting to do the whole or part of the work contemplated by the Contract shall be permitted or required to work more than eight hours in any one calendar day or more than five days in any one week except in cases of extraordinary emergency including fire, flood or danger to life or property. No such person shall be so employed more than eight hours in any day or more than five days in any one week except in such emergency. Time lost in any week because of inclement weather by employees engaged in the construction, reconstruction and maintenance of highways outside of the limits of cities and villages may be made up during that week and/or the succeeding three weeks.

The Contractor further agrees to erect and maintain during construction all necessary guards, rails and signals to prevent accidents to persons, vehicles or to the adjoining property and also agrees to use all necessary precautions in blasting and that he will indemnify and save the County of Westchester harmless from all suits and actions of any kind and nature whatsoever from or on account of the construction of said work.

It is further understood and agreed by the parties hereto that should any dispute arise respecting the true construction, interpretation or meaning of the Contract plans, specifications or conditions herein, or the measurements for the payment thereunder, same shall be referred to and decided by the said Commissioner and his decision thereon shall be final and conclusive upon the parties thereto and may not be challenged except in a proceeding commenced pursuant to Article 78 of the Civil Practice Law and Rules. This provision shall also apply to the true value of and duly authorized extra work or any work permitted by agreement in case any work shall be ordered performed, or any work called for shall be so omitted under and upon the direction of said Commissioner.

The Contractor by the submitting of bids and execution of this Contract hereby covenants and agrees that he has examined the plans, specifications and the site work, as to local conditions, difficulties and accuracy of approximate estimate of quantities and does hereby further covenant and agree that he will not make any claim for damages by reason of any such local conditions, difficulties or variation of approximate estimate of quantities.

The Contractor represents and warrants to the County with the knowledge and expectation that this warranty will be relied upon by the County that it is not now participating and has not at any time participated, either directly or through any substantially owned or affiliated person, firm, partnership or corporation, in an international boycott in violation of the provisions of United States Export Administration Act of 1969, 50 USC 2401 et seq. or the regulations promulgated thereunder.

The Contractor further warrants and represents that it is financially solvent, and sufficiently experienced and competent to perform the work and that the facts provided by it to the County in its bid and supporting documents, and contract documents are true and correct in all respects.

This Contract shall become void and any rights of the Contractor hereunder shall be forfeited if, subsequent to the execution hereof, the Contractor is convicted of a violation of the provision of the United States Export Administration Act of 1969, 50 USC 2401 et seq. as amended or has been found upon the final determination of the United States Commerce Department or any other appropriate agency of the United States or the State of New York to have violated such act or regulations.

If the Contractor, any officer, director, or any party holding a controlling interest (defined as five (5%) percent or more, or in the case of a corporation, any stockholder owning five (5%) percent or more of the outstanding shares) is convicted of a crime (excluding Class B and Unclassified Misdemeanors as defined under the New York State Penal Law and their equivalent in any city, state or under Federal law related to the type of services or activities which are the subject matter of this Contract) or if a related or affiliated company, partnership or corporation is convicted of a crime (excluding Class B and Unclassified Misdemeanors as defined above) after this Contract is fully executed, the County shall have the right to terminate this Agreement immediately and without penalty. An "affiliated company" as used herein means any affiliate which is a partnership, corporation, proprietorship, association or other entity (i) in which a 50% or greater ownership interest (as defined below) is directly or indirectly held by the Contractor or

any of its management personnel (as defined below) or directors, (ii) which directly or indirectly holds 50% or more of the ownership interest in the Contractor, (iii) in which an aggregate 20% or greater ownership interest is directly or indirectly held by one or more shareholders (or partners or proprietors, in the case of a partnership or proprietorship) which or who in the aggregate hold a 20% or greater ownership interest in the Contractor, or (iv) which, whether by Contract or otherwise, directly or indirectly controls, is controlled by or is under common control with the Contractor. An "ownership interest" means the ownership, whether legally or beneficially, of the stock of or assets employed by a corporation, of a partnership interest in or assets employed by a partnership or of a similar interest in or assets employed by any other entity. "Management personnel" means executive officers and all other persons, whether or not officers or employees, who perform policy-making functions similar to those of executive officers.

The Contractor represents that at the time of execution of this Contract, no individual or entity, as described above, has been convicted of a crime during the five (5) year period preceding the execution of this Contract.

Pursuant to Chapter 308 of the Laws of Westchester County (Local Law 18-1997), it is the goal of the County to use its best efforts to encourage, promote and increase participation of business enterprises that are owned and controlled by persons of color or women in contracts and projects funded by the County, and to monitor such participation. The parties agree that the Contractor has completed the questionnaire contained in the bid specifications attached hereto as part of this Agreement.

The County believes it is a laudable goal to provide business opportunities to veterans who were disabled while serving our country, and wants to encourage the participation in County contracts of certified business enterprises owned and controlled by service-disabled veterans. As part of the County's program to encourage the participation of such business enterprises in County contracts, and in furtherance of Article 17-B of the New York State Executive Law, the parties agree that the Contractor has completed the questionnaire entitled Questionnaire Regarding Business Enterprises Owned and Controlled by Service-Disabled Veterans contained in the bid specifications attached hereto as part of this Agreement.

It is recognized and understood by the parties that this Contract is subject to appropriation by the Westchester County Board of Legislators. The County shall have no liability under this Contract beyond the funds, if any, that are appropriated and available for payment of the amounts due under this Contract. Notwithstanding the foregoing, the County will do all things lawfully within its power to obtain, maintain and properly request and pursue funds from which payments under this Contract may be made.

The parties hereto for themselves, their legal representatives, successors and assigns, expressly agree that any legal action or proceeding that may arise out of or relating to this Contract shall be brought and maintained only in the courts of the State of New York ("New York State Court") located in the County of Westchester. With respect to any action between the County and Contractor in New York State Court, the Contractor hereby expressly waives and relinquishes any rights it may otherwise have (i) to move to dismiss on grounds of forum *non*

conveniens; (ii) to remove to Federal Court; and (iii) to move for a change of venue to a New York State Court outside of Westchester County.

The Contractor for itself, its legal representatives, successors or assigns expressly agrees that no legal action or proceeding shall lie or be maintained against the County upon any claims based upon or arising out of this Contract unless such action or proceeding shall be commenced within six (6) months of final acceptance of the work by the Board of Acquisition and Contract, or within six (6) months after the termination of this Contract, whichever first occurs.

This Contract and its terms, covenants, obligations, conditions and provisions shall be binding upon all the parties hereto, their legal representatives, successors and assigns.

This Contract shall not be enforceable until it is signed by all parties and approved by the Office of the County Attorney.

SAMPLE

[Intentionally Left Blank.
Signatures to Follow.]

IN WITNESS WHEREOF, the parties hereto have executed this agreement, THE COUNTY OF WESTCHESTER pursuant to law by:

_____ its Commissioner

and the **CONTRACTOR:**

BY _____ its _____
(Type or Print Name) (Type or Print Title)

THE COUNTY OF WESTCHESTER:

BY: _____
Commissioner

CONTRACTOR:

(SEAL)

ELQ INDUSTRIES, INC.

BY: _____
(Signature)

ATTEST
BY: _____
(Signature)

Recommended:

Department of Public Works and Transportation

Approved as to form and manner of execution this _____ day of _____, 2022

County Attorney

CONTRACTOR'S ACKNOWLEDGMENT
(Corporation)

STATE OF NEW YORK)
 ss:
COUNTY OF)

On this _____ day of _____, 2022, before me personally came
_____ of _____,
known to me to be _____ of _____,
the corporation described in and which executed the within instrument, who being by me duly sworn did
depose and say that the said _____ resides at _____
_____ and that he/she is _____
of said corporation and that he/she signed his/her name thereto by order of the Board of Directors of said
corporation and, if operating under any trade name, that the certificate required by the New York State
General Business Law Section 130 has been filed with the Secretary of State of the State of New York.

NOTARY

CONTRACTOR'S ACKNOWLEDGMENT
(Individual)

STATE OF NEW YORK)
 ss:
COUNTY OF)

On this _____ day of _____, 2022, before me personally came
_____ known to me to be the same person described in and
who executed the within instrument and duly acknowledged to me that he/she executed the same for the
purpose herein mentioned and, if operating under any trade name, that the certificate required by the
New York State General Business Law Section 130 has been filed with the County Clerk of Westchester
County.

NOTARY

CONTRACTOR'S ACKNOWLEDGMENT
(Co-Partnership)

STATE OF NEW YORK)
 ss:
COUNTY OF)

On this _____ day of _____, 2022, before me personally came
_____ known to me to be a member of the firm of _____
_____ and the person described in, and who executed
the within instrument in behalf of said firm, and he acknowledged to me that he executed the same in
behalf of, and as the act of said firm for the purposes herein mentioned and, if operating under any trade
name, that the certificate required by the New York State General Business Law Section 130 has been
filed with the County Clerk of Westchester County.

NOTARY

LIMITED LIABILITY COMPANY ACKNOWLEDGEMENT

STATE OF NEW YORK)
)ss:
COUNTY OF)

On this _____ day of _____, 2022, before me personally came _____ to me known to be the individual who executed the foregoing instrument, and who being duly sworn by me, did depose and say that he/she is (are) _____ of _____
(Member/Manager) (Limited Liability Company)

a Limited Liability Company, and that he/she has authority to sign the same, and acknowledge that he/she executed the same as the act and deed of said Limited Liability Company.

(Signature)

Sworn to before me this _____ day
of _____, 2022

Notary

**CERTIFICATE OF AUTHORITY
(CORPORATION)**

I, _____
(Officer OTHER THAN officer signing contract)

certify that I am _____ of
(Title)

(Name of Corporation)

a corporation duly organized and in good standing under the _____

(Law under which organized, e.g., the New York Business Corporation Law) named in the foregoing agreement; that

(Person executing Agreement)

who signed said Agreement on behalf of the _____
(Name of Corporation)

was at the time of execution _____ of the Corporation and
(Title of such person)

that said agreement was duly signed for and on behalf of said Corporation by authority of its Board of Directors, thereunto duly authorized and that such authority is in full force and effect at the date of hereof.

(Signature)

STATE OF NEW YORK)

)ss:

COUNTY OF)

On the _____ day of _____, in the year 2022, before me, the undersigned, a Notary Public in and for said State, _____ personally appeared, personally known to me or proved to me on the basis of satisfactory evidence to be the officer described in and who executed the above certificate, who being by me duly sworn did depose and say that he/she resides at _____ and he/she is an officer of said corporation; that he/she is duly authorized to execute said certificate on behalf of said corporation, and that he/she signed his/her name thereto pursuant to such authority.

Notary

Date: _____

**CERTIFICATE OF AUTHORITY
LIMITED LIABILITY COMPANY**

I _____
(Member/Manager OTHER THAN person executing Agreement)

certify that I am a _____ of the
Member/Manager
_____ (the "LLC") duly
(Limited Liability Company)

organized under the Laws of the State of _____; that
_____ who signed said agreement on behalf
(Person Executing Agreement)

of the LLC was, at the time of execution, a Member/Manager of the LLC; that said Agreement was duly signed for and on behalf of said LLC and as the act of said LLC for the purposes therein mentioned.

(Signature)

STATE OF NEW YORK)

)ss:
COUNTY OF _____)

On the _____ day of _____, 2022, before me the undersigned, a Notary Public in and for said State, _____ personally appeared, personally known to me or proved to me on the basis of satisfactory evidence to be the Member/Manager described in and who executed the above certificate, who being by me duly sworn did depose and say that he/she resides at

_____ and he/she is a Member/Manager of LLC; that he/she is duly authorized to execute said certificate on behalf of said LLC, and that he/she signed his/her name thereto pursuant to such authority.

Notary

Date: _____

CORPORATE SOLE OFFICER ACKNOWLEDGEMENT

**STATE OF NEW YORK)
)ss:
COUNTY OF)**

On this _____ day of _____, 2022, before me the undersigned,
personally appeared _____ personally
known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose
name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she
executed the same in his/her capacity as President and Sole Officer and Director of
_____ the corporation described in and which
 (Name of Corporation)
executed the within instrument, and acknowledged that he/she owns all the issued and
outstanding capital stock of said corporation, and that by he/she signed the within instrument on
behalf of said corporation.

Notary

SAMPLE

PERFORMANCE AND PAYMENT BOND

Bond No. _____

KNOW ALL BY THESE PRESENT,

that we, _____,
(Insert legal name and address of Contractor)

as Principal (hereinafter, together with its successors, assigns, subcontractors, administrators, executors or any other designees or transferees, collectively the "Principal"), and
_____,
(Insert legal name and address of Surety)

as Surety (hereinafter, together with its successors, assigns, subcontractors, administrators, executors or any other designees or transferees, collectively the "Surety"), are held and firmly bound along with our heirs, executors, administrators, successors and assigns, jointly and severally, unto **THE COUNTY OF WESTCHESTER, 148 Martine Avenue, White Plains, New York 10601**, as Obligee, (hereinafter "Obligee") for payment of the penal sum of _____.

(hereinafter the "Penal Sum"), in lawful money of the United States, as more particularly set forth herein.

Said Penal Sum shall apply separately and independently, in its total amount, to the payment provision and the performance provision of this bond and shall not reduce or limit the right of the Obligee or any other claimant to recover under the other said provision.

THE CONDITION OF THIS OBLIGATION IS SUCH THAT:

WHEREAS, the Obligee, by resolution of its Board of Acquisition and Contract, has authorized the award of an agreement to the Principal for the work (the "Work") commonly described as:

Contract # _____.

WHEREAS, the Principal has entered into an agreement with the Obligee for performance of the Work in strict accordance with the agreement, its attachments and specifications contained therein; (the agreement with all attachments is hereinafter collectively referred to as the "Contract" and are incorporated herein and made a part hereof by reference); and

WHEREAS, by the terms of the Contract, the Principal is required to furnish a bond ensuring the Principal's prompt, full and faithful performance of the Contract.

NOW THEREFORE, if the Principal shall

(1) promptly, fully and faithfully perform the Work and each and all of the terms and obligations to be carried out and performed by the Principal in strict accordance with the terms, conditions and covenants of the Contract as it may be modified or amended from time to time; and if the Principal shall indemnify and save harmless the Obligee and all of its officers, agents and employees from any and all losses, liability and damages, claims, judgments, liens, costs, and fees of every description, which may be incurred by the Obligee by reason of a default or failure on the part of the Principal in the strict performance of any or all of the terms or obligations of the Contract, including all modifications, and amendments, thereto, and any warranties or guarantees required thereunder; and

(2) also promptly make payment of all wages, labor, services, supplies and material rendered or reasonably required for use in the performance of the Contract, of all persons and firms engaged in the Work provided for in the Contract, whether such persons are agents, servants or employees of the Principal, or any subcontractor or of any assignee or designee thereof, regardless of any contractual relationship between the Principal, or any subcontractor or any designee thereof, and further, shall pay or cause to be paid all lawful claims of subcontractors, materialmen and other third persons in connection with the work, labor, services, supplies and material furnished in and about the performance of the Contract, then this obligation shall be void; otherwise, it shall be, and remain, in full force and effect.

PROVIDED, however, that this bond is subject to the following additional terms and conditions:

The Surety, for value received, hereby stipulates and agrees that no change, adjustment of the time for performance of the Contract, any extension of time, adjustment of the Contract's not-to-exceed amount, any payment whether or not before the time required, any waiver of any provision, or by an assignment, subletting or other transfer of any of the Work, or of payment or non-payment of any moneys due or to become due under the Contract, any alterations, deletions, additions, or any other modifications to the terms of the Contract, the Work to be performed, or to the Contract specifications shall limit, restrict or otherwise impair Surety's obligations or Obligee's rights hereunder; The Surety hereby waives notice of any and all of such changes, modifications to the Contract, including but not limited to extensions of time for performance, adjustments of the Contract not-to-exceed amount, modifications, changes in the Work to be performed, alterations, deletions, omissions, additions, changes, payments, waivers, any changes in time, assignments, subcontracts and transfers; And the Surety hereby stipulates and agrees that any and all actions performed or omitted by and in relation to executors, administrators, successors, assigns, Subcontractors, and other designees, shall have the

same effect as to said Surety as though done or omitted to be done by and in relation to said Principal.

In the event of a failure of strict performance of the Contract by the Principal, which shall include, but not be limited to, any breach or default of the Contract by the Principal, and within fifteen (15) days after written notice from the Oblige to the Surety of the Principal's breach or default of the Contract, the Surety shall provide Oblige with written notice of its assumption of all obligations hereunder and request Oblige's approval of its proposed election ("Notice of Assumption and Election") to either: a) remedy or cause to be remedied the default or breach of the Principal Contract and cause the Principal to immediately commence and timely complete the Contract; or b) to take charge of the Work of the Contract and immediately commence and timely complete the Work at its own expense itself, through its agents or independent qualified contractors proposed by the Surety and acceptable to Oblige; provided, however, that the Surety hereby stipulates and agrees that both its proposed remedy procedure ("a" and "b" above) and proposed independent contractor, if any, in Surety's Notice of Assumption and Election shall be subject to the prior written approval of the Oblige, which approval shall be granted or withheld in the Oblige's sole discretion, and subject to Oblige's receipt of any and all necessary legal approvals. Surety shall, within five (5) days after written approval from the Oblige of Surety's Notice of Assumption and Election, commence or cause to be commenced the completion of the Work in strict accordance with its Notice of Assumption and Election and the terms, conditions and covenants of the Contract as they may be modified or amended from time to time, time being of the essence for the performance of the Work and this bond. The Surety shall not assert solvency/insolvency of the Principal or the Principal's denial of default as justification for its failure to give the Notice of Assumption and Election, or for its failure to promptly remedy the failure of performance or default of the Principal, or to complete the Work.

In the event the Surety shall fail to issue the Notice of Assumption and Election to Oblige and/or Surety fails to commence completion of the Work within the time periods provided above, the Oblige may thereafter cause the cure or remedy of the Principal's failure of performance or default, or complete the Work. The Principal and the Surety shall be each jointly and severally liable to the Oblige for all damages and costs sustained by the Oblige as a result of the Principal's failure of performance under the Contract or default in its performance of obligations thereunder, including without limitation the costs of cure or completion exceeding the then remaining balance of the Contract Price, and any other remedy available to Oblige; provided that the Surety's liability hereunder for the costs of performance, damages and other costs sustained by the Oblige upon the Principal's failure of performance under or default under the Contract shall be limited to the Penal Sum hereof, which shall be deemed to include the costs or value of any modifications to the Work which increases the Contract Price, plus the amount of costs, expenses and fees, including reasonable attorneys' fees in connection with any suit or other proceeding brought upon this bond by the Oblige, as more particularly set forth herein.

All persons who have performed labor or rendered services, as aforesaid, all subcontractors, and all persons, firms, corporations, including materialmen and third persons, as aforesaid, furnishing work, labor, services, supplies and material under or in connection with said Contract or in or about the performance and completion thereof, shall have a direct right of action (subject to the prior right of the Obligee under any claim which it may assert against the Principal and/or the Surety) against the Principal on this bond, upon first furnishing the Obligee with a Bond of Indemnity for costs in an amount satisfactory to the Obligee, which right of action shall be asserted in proceedings instituted in the State in which such work, labor, services, supplies or material was performed, rendered or furnished or where work, labor, services, supplies or material has been performed, rendered or furnished, as aforesaid, in more than one State, than in any such State, no later than one (1) year after the complete performance of said Contract and final settlement thereof.

The Surety shall not be liable hereunder for any damages or compensation recoverable under any worker's compensation or employer's liability statute.

In no event shall the Surety be liable under the foregoing clauses for a greater sum than the Penal Sum of this bond, plus the amount of costs, expenses and fees, including reasonable attorneys' fees in connection with any suit or other proceeding brought upon this bond by the Obligee, as more particularly set forth herein, provided; however, that said Penal Sum is separately and independently applicable, in its total amount to the payment provision and the performance provision of this bond, and shall not reduce or limit the right of the Obligee to recover under the other said provision, or reduce or limit any suit, action or proceeding hereon that is instituted by any person, firm or corporation under the provisions of the payment provision of this bond. The Principal and the Surety do hereby expressly waive any objections that might be interposed as to the right of the Obligee 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 said Obligee to require the foregoing provision to be placed in this Bond.

Notices to the Surety, Principal and Obligee shall be mailed via certified mail, return receipt requested, or delivered to the addresses shown in the preamble. Notice shall be effective on the date of receipt.

The Penal Sum of this bond is in addition to any other bond furnished by the Principal to the Obligee and in no way shall be impaired or affected by any other bond.

In the event that any suit or other proceeding is brought upon this bond by the Obligee, the Surety shall pay to the Obligee all costs, expenses and fees incurred by the Obligee in connection therewith, including without limitation, attorneys' fees.

[NO FURTHER TEXT ON THIS PAGE. SIGNATURE PAGE FOLLOWS.]

SAMPLE

IN WITNESS WHEREOF, the Principal and Surety have executed this Performance and Payment Bond this _____ day of _____, 20__, by their duly authorized agents or representatives.

PRINCIPAL:

(Corporate Seal)

Principal Name and Title

Principal Signature

SURETY:

(Corporate Seal)

Surety Name

Surety Signature

(Attach Attorney-in-Fact Certificate)

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.

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 the 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) duly certified copy of latest published financial statement of assets and liabilities of Surety.

SCHEDULE "A"

STANDARD INSURANCE PROVISIONS
(Contractor)

1. Prior to commencing work, and throughout the term of the Agreement, the Contractor shall obtain at its own cost and expense the required insurance as delineated below from insurance companies licensed in the State of New York, carrying a Best's financial rating of A or better. Contractor shall provide evidence of such insurance to the County of Westchester ("County"), either by providing a copy of policies and/or certificates as may be required and approved by the Director of Risk Management of the County ("Director"). The policies or certificates thereof shall provide that ten (10) days prior to cancellation or material change in the policy, notices of same shall be given to the Director either by overnight mail or personal delivery for all of the following stated insurance policies. All notices shall name the Contractor and identify the Agreement.

If at any time any of the policies required herein shall be or become unsatisfactory to the Director, as to form or substance, or if a company issuing any such policy shall be or become unsatisfactory to the Director, the Contractor shall upon notice to that effect from the County, promptly obtain a new policy, and submit the policy or the certificate as requested by the Director to the Office of Risk Management of the County for approval by the Director. Upon failure of the Contractor to furnish, deliver and maintain such insurance, the Agreement, at the election of the County, may be declared suspended, discontinued or terminated.

Failure of the Contractor to take out, maintain, or the taking out or maintenance of any required insurance, shall not relieve the Contractor from any liability under the Agreement, nor shall the insurance requirements be construed to conflict with or otherwise limit the contractual obligations of the Contractor concerning indemnification.

All property losses shall be made payable to the "County of Westchester" and adjusted with the appropriate County personnel.

In the event that claims, for which the County may be liable, in excess of the insured amounts provided herein are filed by reason of Contractor's negligent acts or omissions under the Agreement or by virtue of the provisions of the labor law or other statute or any other reason, the amount of excess of such claims or any portion thereof, may be withheld from payment due or to become due the Contractor until such time as the Contractor shall furnish such additional security covering such claims in form satisfactory to the Director.

In the event of any loss, if the Contractor maintains broader coverage and/or higher limits than the minimums identified herein, the County shall be entitled to the broader coverage and/or higher limits maintained by the Contractor. Any available insurance proceeds in excess of the specified minimum limits of insurance and coverage shall be available to the County.

2. The Contractor shall provide proof of the following coverage (if additional coverage is required for a specific agreement, those requirements will be described in the Agreement):

- a) Workers' Compensation and Employer's Liability. Certificate form C-105.2 or State Fund Insurance Company form U-26.3 is required for proof of compliance with the New York State Workers' Compensation Law. State Workers' Compensation Board form DB-120.1 is required for proof of compliance with the New York State Disability Benefits Law. Location of operation shall be "All locations in Westchester County, New York."

Where an applicant claims to not be required to carry either a Workers' Compensation Policy or Disability Benefits Policy, or both, the employer must complete NYS form CE-200, available to download at: <http://www.wcb.ny.gov>.

If the employer is self-insured for Workers' Compensation, he/she should present a certificate from the New York State Worker's Compensation Board evidencing that fact (Either SI-12, Certificate of Workers' Compensation Self-Insurance, or GSI-105.2, Certificate of Participation in Workers' Compensation Group Self-Insurance).

- b) Commercial General Liability Insurance with a combined single limit of \$1,000,000 (c.s.1) per occurrence and a \$2,000,000 aggregate limit naming the "County of Westchester" as an additional insured on a primary and non-contributory basis. This insurance shall include the following coverages:
 - i. Premises - Operations.
 - ii. Broad Form Contractual.
 - iii. Independent Contractor and Sub-Contractor.
 - iv. Products and Completed Operations.
- c) Commercial Umbrella/Excess Insurance: \$2,000,000 each Occurrence and Aggregate naming the "County of Westchester" as additional insured, written on a "follow the form" basis.

NOTE: Additional insured status shall be provided by standard or other endorsement that extends coverage to the County for both on-going and completed operations.

All Contracts involving the use of explosives, demolition and/or underground work shall provide proof that XCU is covered.

- d) Automobile Liability Insurance with a minimum limit of liability per occurrence of \$1,000,000 for bodily injury and a minimum limit of \$100,000 per occurrence for property damage or a combined single limit of \$1,000,000 unless otherwise indicated in the contract specifications. This insurance shall include for bodily injury and property damage the following coverages and name the "County of Westchester" as additional insured:
 - (i) Owned automobiles.
 - (ii) Hired automobiles.
 - (iii) Non-owned automobiles.

- e) With regard to the insurance coverage provided for in Section 2, subsections b), c) and d) above, in addition to naming the "County of Westchester" as an additional insured, the Contractor shall also name "Standard Amusements LLC" as an additional insured with regard to any contract, work or project to be performed at Playland Park in Rye, New York, on the same terms and conditions as provided for the benefit of the County of Westchester.

3. All policies of the Contractor shall be endorsed to contain the following clauses:

(a) Insurers shall have no right to recovery or subrogation against the County (including its employees and other agents and agencies), it being the intention of the parties that the insurance policies so effected shall protect both parties and be primary coverage for any and all losses covered by the above-described insurance.

(b) The clause "other insurance provisions" in a policy in which the County is named as an insured, shall not apply to the County.

(c) The insurance companies issuing the policy or policies shall have no recourse against the County (including its agents and agencies as aforesaid) for payment of any premiums or for assessments under any form of policy.

(d) Any and all deductibles in the above described insurance policies shall be assumed by and be for the account of, and at the sole risk of, the Contractor.

Certificate Holder should only read: The County of Westchester, 148 Martine Avenue, White Plains, New York 10601

PLEASE NOTE: A printed copy of your full insurance policy is required



SCHEDULE OF HOURLY RATES
AND SUPPLEMENTS

DEPARTMENT OF PUBLIC WORKS

Division of Engineering



Kathy Hochul, Governor

Roberta Reardon, Commissioner

Westchester County DPW & T

Yolanda Spraggins, Secretary II
148 Martine Ave., Rm 518
White Plains NY 10601

Schedule Year 2022 through 2023
Date Requested 08/29/2022
PRC# 2022010008

Location Playland Park
Project ID# 22-523
Project Type Infrastructure Rehabilitation - Phase 3 Playland Park, Rye, New York

PREVAILING WAGE SCHEDULE FOR ARTICLE 8 PUBLIC WORK PROJECT

Attached is the current schedule(s) of the prevailing wage rates and prevailing hourly supplements for the project referenced above. A unique Prevailing Wage Case Number (PRC#) has been assigned to the schedule(s) for your project.

The schedule is effective from July 2022 through June 2023. All updates, corrections, posted on the 1st business day of each month, and future copies of the annual determination are available on the Department's website www.labor.ny.gov. Updated PDF copies of your schedule can be accessed by entering your assigned PRC# at the proper location on the website.

It is the responsibility of the contracting agency or its agent to annex and make part, the attached schedule, to the specifications for this project, when it is advertised for bids and /or to forward said schedules to the successful bidder(s), immediately upon receipt, in order to insure the proper payment of wages.

Please refer to the "General Provisions of Laws Covering Workers on Public Work Contracts" provided with this schedule, for the specific details relating to other responsibilities of the Department of Jurisdiction.

Upon completion or cancellation of this project, enter the required information and mail **OR** fax this form to the office shown at the bottom of this notice, **OR** fill out the electronic version via the NYSDOL website.

NOTICE OF COMPLETION / CANCELLATION OF PROJECT

Date Completed: _____ Date Cancelled: _____

Name & Title of Representative: _____

Phone: (518) 457-5589 Fax: (518) 485-1870
W. Averell Harriman State Office Campus, Bldg. 12, Room 130, Albany, NY 12240

General Provisions of Laws Covering Workers on Article 8 Public Work Contracts

Introduction

The Labor Law requires public work contractors and subcontractors to pay laborers, workers, or mechanics employed in the performance of a public work contract not less than the prevailing rate of wage and supplements (fringe benefits) in the locality where the work is performed.

Responsibilities of the Department of Jurisdiction

A Department of Jurisdiction (Contracting Agency) includes a state department, agency, board or commission; a county, city, town or village; a school district, board of education or board of cooperative educational services; a sewer, water, fire, improvement and other district corporation; a public benefit corporation; and a public authority awarding a public work contract.

The Department of Jurisdiction (Contracting Agency) awarding a public work contract MUST obtain a Prevailing Rate Schedule listing the hourly rates of wages and supplements due the workers to be employed on a public work project. This schedule may be obtained by completing and forwarding a "Request for wage and Supplement Information" form (PW 39) to the Bureau of Public Work. The Prevailing Rate Schedule MUST be included in the specifications for the contract to be awarded and is deemed part of the public work contract.

Upon the awarding of the contract, the law requires that the Department of Jurisdiction (Contracting Agency) furnish the following information to the Bureau: the name and address of the contractor, the date the contract was let and the approximate dollar value of the contract. To facilitate compliance with this provision of the Labor Law, a copy of the Department's "Notice of Contract Award" form (PW 16) is provided with the original Prevailing Rate Schedule.

The Department of Jurisdiction (Contracting Agency) is required to notify the Bureau of the completion or cancellation of any public work project. The Department's PW 200 form is provided for that purpose.

Both the PW 16 and PW 200 forms are available for completion [online](#).

Hours

No laborer, worker, or mechanic in the employ of a contractor or subcontractor engaged in the performance of any public work project shall be permitted to work more than eight hours in any day or more than five days in any week, except in cases of extraordinary emergency. The contractor and the Department of Jurisdiction (Contracting Agency) may apply to the Bureau of Public Work for a dispensation permitting workers to work additional hours or days per week on a particular public work project.

There are very few exceptions to this rule. Complete information regarding these exceptions is available on the ["Request for a dispensation to work overtime" form \(PW30\)](#) and ["4 Day / 10 Hour Work Schedule" form \(PW 30.1\)](#).

Wages and Supplements

The wages and supplements to be paid and/or provided to laborers, workers, and mechanics employed on a public work project shall be not less than those listed in the current Prevailing Rate Schedule for the locality where the work is performed. If a prime contractor on a public work project has not been provided with a Prevailing Rate Schedule, the contractor must notify the Department of Jurisdiction (Contracting Agency) who in turn must request an original Prevailing Rate Schedule form the Bureau of Public Work. Requests may be submitted by: mail to NYSDOL, Bureau of Public Work, State Office Bldg. Campus, Bldg. 12, Rm. 130, Albany, NY 12240; Fax to Bureau of Public Work (518) 485-1870; or electronically at the NYSDOL website www.labor.ny.gov.

Upon receiving the original schedule, the Department of Jurisdiction (Contracting Agency) is REQUIRED to provide complete copies to all prime contractors who in turn MUST, by law, provide copies of all applicable county schedules to each subcontractor and obtain from each subcontractor, an affidavit certifying such schedules were received. If the original schedule expired, the contractor may obtain a copy of the new annual determination from the NYSDOL website www.labor.ny.gov.

The Commissioner of Labor makes an annual determination of the prevailing rates. This determination is in effect from July 1st through June 30th of the following year. The annual determination is available on the NYSDOL website www.labor.ny.gov.

Payrolls and Payroll Records

Every contractor and subcontractor MUST keep original payrolls or transcripts subscribed and affirmed as true under penalty of perjury. As per Article 6 of the Labor law, contractors and subcontractors are required to establish, maintain, and preserve for not less than six (6) years, contemporaneous, true, and accurate payroll records. At a minimum, payrolls must show the following information for each person employed on a public work project: Name, Address, Last 4 Digits of Social Security Number, Classification(s) in which the worker was employed, Hourly wage rate(s) paid, Supplements paid

or provided, and Daily and weekly number of hours worked in each classification.

The filing of payrolls to the Department of Jurisdiction is a condition of payment. Every contractor and subcontractor shall submit to the Department of Jurisdiction (Contracting Agency), within thirty (30) days after issuance of its first payroll and every thirty (30) days thereafter, a transcript of the original payrolls, subscribed and affirmed as true under penalty of perjury. The Department of Jurisdiction (Contracting Agency) shall collect, review for facial validity, and maintain such payrolls.

In addition, the Commissioner of Labor may require contractors to furnish, with ten (10) days of a request, payroll records sworn to as their validity and accuracy for public work and private work. Payroll records include, but are not limited to time cards, work description sheets, proof that supplements were provided, cancelled payroll checks and payrolls. Failure to provide the requested information within the allotted ten (10) days will result in the withholding of up to 25% of the contract, not to exceed \$100,000.00. If the contractor or subcontractor does not maintain a place of business in New York State and the amount of the contract exceeds \$25,000.00, payroll records and certifications must be kept on the project worksite.

The prime contractor is responsible for any underpayments of prevailing wages or supplements by any subcontractor.

All contractors or their subcontractors shall provide to their subcontractors a copy of the Prevailing Rate Schedule specified in the public work contract as well as any subsequently issued schedules. A failure to provide these schedules by a contractor or subcontractor is a violation of Article 8, Section 220-a of the Labor Law.

All subcontractors engaged by a public work project contractor or its subcontractor, upon receipt of the original schedule and any subsequently issued schedules, shall provide to such contractor a verified statement attesting that the subcontractor has received the Prevailing Rate Schedule and will pay or provide the applicable rates of wages and supplements specified therein. (See NYS Labor Laws, Article 8 . Section 220-a).

Determination of Prevailing Wage and Supplement Rate Updates Applicable to All Counties

The wages and supplements contained in the annual determination become effective July 1st whether or not the new determination has been received by a given contractor. Care should be taken to review the rates for obvious errors. Any corrections should be brought to the Department's attention immediately. It is the responsibility of the public work contractor to use the proper rates. If there is a question on the proper classification to be used, please call the district office located nearest the project. Any errors in the annual determination will be corrected and posted to the NYSDOL website on the first business day of each month. Contractors are responsible for paying these updated rates as well, retroactive to July 1st.

When you review the schedule for a particular occupation, your attention should be directed to the dates above the column of rates. These are the dates for which a given set of rates is effective. To the extent possible, the Department posts rates in its possession that cover periods of time beyond the July 1st to June 30th time frame covered by a particular annual determination. Rates that extend beyond that instant time period are informational ONLY and may be updated in future annual determinations that actually cover the then appropriate July 1st to June 30th time period.

Withholding of Payments

When a complaint is filed with the Commissioner of Labor alleging the failure of a contractor or subcontractor to pay or provide the prevailing wages or supplements, or when the Commissioner of Labor believes that unpaid wages or supplements may be due, payments on the public work contract shall be withheld from the prime contractor in a sufficient amount to satisfy the alleged unpaid wages and supplements, including interest and civil penalty, pending a final determination.

When the Bureau of Public Work finds that a contractor or subcontractor on a public work project failed to pay or provide the requisite prevailing wages or supplements, the Bureau is authorized by Sections 220-b and 235.2 of the Labor Law to so notify the financial officer of the Department of Jurisdiction (Contracting Agency) that awarded the public work contract. Such officer MUST then withhold or cause to be withheld from any payment due the prime contractor on account of such contract the amount indicated by the Bureau as sufficient to satisfy the unpaid wages and supplements, including interest and any civil penalty that may be assessed by the Commissioner of Labor. The withholding continues until there is a final determination of the underpayment by the Commissioner of Labor or by the court in the event a legal proceeding is instituted for review of the determination of the Commissioner of Labor.

The Department of Jurisdiction (Contracting Agency) shall comply with this order of the Commissioner of Labor or of the court with respect to the release of the funds so withheld.

Summary of Notice Posting Requirements

The current Prevailing Rate Schedule must be posted in a prominent and accessible place on the site of the public work project. The prevailing wage schedule must be encased in, or constructed of, materials capable of withstanding adverse weather conditions and be titled "PREVAILING RATE OF WAGES" in letters no smaller than two (2) inches by two (2) inches.

The "Public Work Project" notice must be posted at the beginning of the performance of every public work contract, on each job site.

Every employer providing workers' compensation insurance and disability benefits must post notices of such coverage in the format prescribed by the Workers' Compensation Board in a conspicuous place on the jobsite.

Every employer subject to the NYS Human Rights Law must conspicuously post at its offices, places of employment, or employment training centers, notices furnished by the State Division of Human Rights.

Employers liable for contributions under the Unemployment Insurance Law must conspicuously post on the jobsite notices furnished by the NYS Department of Labor.

Apprentices

Employees cannot be paid apprentice rates unless they are individually registered in a program registered with the NYS Commissioner of Labor. The allowable ratio of apprentices to journeyworkers in any craft classification can be no greater than the statewide building trade ratios promulgated by the Department of Labor and included with the Prevailing Rate Schedule. An employee listed on a payroll as an apprentice who is not registered as above or is performing work outside the classification of work for which the apprentice is indentured, must be paid the prevailing journeyworker's wage rate for the classification of work the employee is actually performing.

NYSDOL Labor Law, Article 8, Section 220-3, require that only apprentices individually registered with the NYS Department of Labor may be paid apprenticeship rates on a public work project. No other Federal or State Agency of office registers apprentices in New York State.

Persons wishing to verify the apprentice registration of any person must do so in writing by mail, to the NYSDOL Office of Employability Development / Apprenticeship Training, State Office Bldg. Campus, Bldg. 12, Albany, NY 12240 or by Fax to NYSDOL Apprenticeship Training (518) 457-7154. All requests for verification must include the name and social security number of the person for whom the information is requested.

The only conclusive proof of individual apprentice registration is written verification from the NYSDOL Apprenticeship Training Albany Central office. Neither Federal nor State Apprenticeship Training offices outside of Albany can provide conclusive registration information.

It should be noted that the existence of a registered apprenticeship program is not conclusive proof that any person is registered in that program. Furthermore, the existence or possession of wallet cards, identification cards, or copies of state forms is not conclusive proof of the registration of any person as an apprentice.

Interest and Penalties

In the event that an underpayment of wages and/or supplements is found:

- Interest shall be assessed at the rate then in effect as prescribed by the Superintendent of Banks pursuant to section 14-a of the Banking Law, per annum from the date of underpayment to the date restitution is made.
- A Civil Penalty may also be assessed, not to exceed 25% of the total of wages, supplements, and interest due.

Debarment

Any contractor or subcontractor and/or its successor shall be ineligible to submit a bid on or be awarded any public work contract or subcontract with any state, municipal corporation or public body for a period of five (5) years when:

- Two (2) willful determinations have been rendered against that contractor or subcontractor and/or its successor within any consecutive six (6) year period.
- There is any willful determination that involves the falsification of payroll records or the kickback of wages or supplements.

Criminal Sanctions

Willful violations of the Prevailing Wage Law (Article 8 of the Labor Law) may be a felony punishable by fine or imprisonment of up to 15 years, or both.

Discrimination

No employee or applicant for employment may be discriminated against on account of age, race, creed, color, national origin, sex, disability or marital status.

No contractor, subcontractor nor any person acting on its behalf, shall by reason of race, creed, color, disability, sex 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 (NYS Labor Law, Article 8, Section 220-e(a)).

No contractor, subcontractor, nor any person acting on its behalf, shall in any manner, discriminate against or intimidate any employee on account of race, creed, color, disability, sex, or national origin (NYS Labor Law, Article 8, Section 220-e(b)).

The Human Rights Law also prohibits discrimination in employment because of age, marital status, or religion.

There may be deducted from the amount payable to the contractor under the contract a penalty of \$50.00 for each calendar day during which such person was discriminated against or intimidated in violation of the provision of the contract (NYS Labor Law, Article 8, Section 220-e(c)).

The contract may be cancelled or terminated by the State or municipality. All monies due or to become due thereunder may be forfeited for a second or any subsequent violation of the terms or conditions of the anti-discrimination sections of the contract (NYS Labor Law, Article 8, Section 220-e(d)).

Every employer subject to the New York State Human Rights Law must conspicuously post at its offices, places of employment, or employment training centers notices furnished by the State Division of Human Rights.

Workers' Compensation

In accordance with Section 142 of the State Finance Law, the contractor shall maintain coverage during the life of the contract for the benefit of such employees as required by the provisions of the New York State Workers' Compensation Law.

A contractor who is awarded a public work contract must provide proof of workers' compensation coverage prior to being allowed to begin work.

The insurance policy must be issued by a company authorized to provide workers' compensation coverage in New York State. Proof of coverage must be on form C-105.2 (Certificate of Workers' Compensation Insurance) and must name this agency as a certificate holder.

If New York State coverage is added to an existing out-of-state policy, it can only be added to a policy from a company authorized to write workers' compensation coverage in this state. The coverage must be listed under item 3A of the information page.

The contractor must maintain proof that subcontractors doing work covered under this contract secured and maintained a workers' compensation policy for all employees working in New York State.

Every employer providing worker's compensation insurance and disability benefits must post notices of such coverage in the format prescribed by the Workers' Compensation Board in a conspicuous place on the jobsite.

Unemployment Insurance

Employers liable for contributions under the Unemployment Insurance Law must conspicuously post on the jobsite notices furnished by the New York State Department of Labor.



Kathy Hochul, Governor

Roberta Reardon, Commissioner

Westchester County DPW & T

Yolanda Spraggins, Secretary II
148 Martine Ave., Rm 518
White Plains NY 10601

Schedule Year 2022 through 2023
Date Requested 08/29/2022
PRC# 2022010008

Location Playland Park
Project ID# 22-523
Project Type Infrastructure Rehabilitation - Phase 3 Playland Park, Rye, New York

Notice of Contract Award

New York State Labor Law, Article 8, Section 220.3a requires that certain information regarding the awarding of public work contracts, be furnished to the Commissioner of Labor. One "Notice of Contract Award" (PW 16, which may be photocopied), **MUST** be completed for **EACH** prime contractor on the above referenced project.

Upon notifying the successful bidder(s) of this contract, enter the required information and mail **OR** fax this form to the office shown at the bottom of this notice, **OR** fill out the electronic version via the NYSDOL website.

Contractor Information

All information must be supplied

Federal Employer Identification Number: _____		
Name: _____		
Address: _____ _____		
City: _____	State: _____	Zip: _____
Amount of Contract: \$ _____	Contract Type:	
Approximate Starting Date: ____/____/____	<input type="checkbox"/> (01) General Construction	
Approximate Completion Date: ____/____/____	<input type="checkbox"/> (02) Heating/Ventilation	
	<input type="checkbox"/> (03) Electrical	
	<input type="checkbox"/> (04) Plumbing	
	<input type="checkbox"/> (05) Other : _____	

Phone: (518) 457-5589 Fax: (518) 485-1870
W. Averell Harriman State Office Campus, Bldg. 12, Room 130, Albany, NY 12240

Social Security Numbers on Certified Payrolls:

The Department of Labor is cognizant of the concerns of the potential for misuse or inadvertent disclosure of social security numbers. Identity theft is a growing problem and we are sympathetic to contractors' concern regarding inclusion of this information on payrolls if another identifier will suffice.

For these reasons, the substitution of the use of the last four digits of the social security number on certified payrolls submitted to contracting agencies on public work projects is now acceptable to the Department of Labor. This change does not affect the Department's ability to request and receive the entire social security number from employers during its public work/ prevailing wage investigations.

Construction Industry Fair Play Act: Required Posting for Labor Law Article 25-B § 861-d

Construction industry employers must post the "Construction Industry Fair Play Act" notice in a prominent and accessible place on the job site. Failure to post the notice can result in penalties of up to \$1,500 for a first offense and up to \$5,000 for a second offense. The posting is included as part of this wage schedule. Additional copies may be obtained from the NYS DOL website, <https://dol.ny.gov/public-work-and-prevailing-wage>

If you have any questions concerning the Fair Play Act, please call the State Labor Department toll-free at 1-866-435-1499 or email us at: dol.misclassified@labor.ny.gov .

Worker Notification: (Labor Law §220, paragraph a of subdivision 3-a)

Effective June 23, 2020

This provision is an addition to the existing wage rate law, Labor Law §220, paragraph a of subdivision 3-a. It requires contractors and subcontractors to provide written notice to all laborers, workers or mechanics of the *prevailing wage and supplement rate* for their particular job classification *on each pay stub**. It also requires contractors and subcontractors to *post a notice* at the beginning of the performance of every public work contract *on each job site* that includes the telephone number and address for the Department of Labor and a statement informing laborers, workers or mechanics of their right to contact the Department of Labor if he/she is not receiving the proper prevailing rate of wages and/or supplements for his/her job classification. The required notification will be provided with each wage schedule, may be downloaded from our website www.labor.ny.gov or be made available upon request by contacting the Bureau of Public Work at 518-457-5589. *In the event the required information will not fit on the pay stub, an accompanying sheet or attachment of the information will suffice.

(12.20)

**To all State Departments, Agency Heads and Public Benefit Corporations
IMPORTANT NOTICE REGARDING PUBLIC WORK ENFORCEMENT FUND**

Budget Policy & Reporting Manual

B-610

Public Work Enforcement Fund

effective date December 7, 2005

1. Purpose and Scope:

This Item describes the Public Work Enforcement Fund (the Fund, PWEF) and its relevance to State agencies and public benefit corporations engaged in construction or reconstruction contracts, maintenance and repair, and announces the recently-enacted increase to the percentage of the dollar value of such contracts that must be deposited into the Fund. This item also describes the roles of the following entities with respect to the Fund:

- New York State Department of Labor (DOL),
- The Office of the State of Comptroller (OSC), and
- State agencies and public benefit corporations.

2. Background and Statutory References:

DOL uses the Fund to enforce the State's Labor Law as it relates to contracts for construction or reconstruction, maintenance and repair, as defined in subdivision two of Section 220 of the Labor Law. State agencies and public benefit corporations participating in such contracts are required to make payments to the Fund.

Chapter 511 of the Laws of 1995 (as amended by Chapter 513 of the Laws of 1997, Chapter 655 of the Laws of 1999, Chapter 376 of the Laws of 2003 and Chapter 407 of the Laws of 2005) established the Fund.

3. Procedures and Agency Responsibilities:

The Fund is supported by transfers and deposits based on the value of contracts for construction and reconstruction, maintenance and repair, as defined in subdivision two of Section 220 of the Labor Law, into which all State agencies and public benefit corporations enter.

Chapter 407 of the Laws of 2005 increased the amount required to be provided to this fund to .10 of one-percent of the total cost of each such contract, to be calculated at the time agencies or public benefit corporations enter into a new contract or if a contract is amended. The provisions of this bill became effective August 2, 2005.

**To all State Departments, Agency Heads and Public Benefit Corporations
IMPORTANT NOTICE REGARDING PUBLIC WORK ENFORCEMENT FUND**

OSC will report to DOL on all construction-related ("D") contracts approved during the month, including contract amendments, and then DOL will bill agencies the appropriate assessment monthly. An agency may then make a determination if any of the billed contracts are exempt and so note on the bill submitted back to DOL. For any instance where an agency is unsure if a contract is or is not exempt, they can call the Bureau of Public Work at the number noted below for a determination. Payment by check or journal voucher is due to DOL within thirty days from the date of the billing. DOL will verify the amounts and forward them to OSC for processing.

For those contracts which are not approved or administered by the Comptroller, monthly reports and payments for deposit into the Public Work Enforcement Fund must be provided to the Administrative Finance Bureau at the DOL within 30 days of the end of each month or on a payment schedule mutually agreed upon with DOL.

Reports should contain the following information:

- Name and billing address of State agency or public benefit corporation;
- State agency or public benefit corporation contact and phone number;
- Name and address of contractor receiving the award;
- Contract number and effective dates;
- Contract amount and PWEF assessment charge (if contract amount has been amended, reflect increase or decrease to original contract and the adjustment in the PWEF charge); and
- Brief description of the work to be performed under each contract.

Checks and Journal Vouchers, payable to the "New York State Department of Labor" should be sent to:

Department of Labor
Administrative Finance Bureau-PWEF Unit
Building 12, Room 464
State Office Campus
Albany, NY 12240

Any questions regarding billing should be directed to NYSDOL's Administrative Finance Bureau-PWEF Unit at (518) 457-3624 and any questions regarding Public Work Contracts should be directed to the Bureau of Public Work at (518) 457-5589.

Required Notice under Article 25-B of the Labor Law

**Attention All Employees, Contractors and Subcontractors:
You are Covered by the Construction Industry Fair Play Act**

The law says that you are an employee unless:

- You are free from direction and control in performing your job, **and**
- You perform work that is not part of the usual work done by the business that hired you, **and**
- You have an independently established business.

Your employer cannot consider you to be an independent contractor unless all three of these facts apply to your work.

It is against the law for an employer to misclassify employees as independent contractors or pay employees off the books.

Employee Rights: If you are an employee, you are entitled to state and federal worker protections. These include:

- Unemployment Insurance benefits, if you are unemployed through no fault of your own, able to work, and otherwise qualified,
- Workers' compensation benefits for on-the-job injuries,
- Payment for wages earned, minimum wage, and overtime (under certain conditions),
- Prevailing wages on public work projects,
- The provisions of the National Labor Relations Act, and
- A safe work environment.

It is a violation of this law for employers to retaliate against anyone who asserts their rights under the law. Retaliation subjects an employer to civil penalties, a private lawsuit or both.

Independent Contractors: If you are an independent contractor, **you must pay all taxes and Unemployment Insurance contributions required by New York State and Federal Law.**

Penalties for paying workers off the books or improperly treating employees as independent contractors:

- **Civil Penalty** First offense: Up to \$2,500 per employee
 Subsequent offense(s): Up to \$5,000 per employee
- **Criminal Penalty** First offense: Misdemeanor - up to 30 days in jail, up to a \$25,000 fine and debarment from performing public work for up to one year.
 Subsequent offense(s): Misdemeanor - up to 60 days in jail or up to a \$50,000 fine and debarment from performing public work for up to 5 years.

If you have questions about your employment status or believe that your employer may have violated your rights and you want to file a complaint, call the Department of Labor at (866) 435-1499 or send an email to dol.misclassified@labor.ny.gov. All complaints of fraud and violations are taken seriously. You can remain anonymous.

Employer Name:

IA 999 (09/16)

Attention Employees

THIS IS A: **PUBLIC WORK PROJECT**

If you are employed on this project as a **worker, laborer, or mechanic** you are entitled to receive the **prevailing wage and supplements rate** for the classification at which you are working.

Chapter 629 of the Labor Laws of 2007:

These wages are set by law and must be posted at the work site. They can also be found at:

<https://dol.ny.gov/public-work-and-prevailing-wage>

If you feel that you have not received proper wages or benefits, please call our nearest office.*

Albany	(518) 457-2744	Patchogue	(631) 687-4882
Binghamton	(607) 721-8005	Rochester	(585) 258-4505
Buffalo	(716) 847-7159	Syracuse	(315) 428-4056
Garden City	(516) 228-3915	Utica	(315) 793-2314
New York City	(212) 932-2419	White Plains	(914) 997-9507
Newburgh	(845) 568-5156		

* For New York City government agency construction projects, please contact the Office of the NYC Comptroller at (212) 669-4443, or www.comptroller.nyc.gov – click on Bureau of Labor Law.

Contractor Name: _____

Project Location: _____

Requirements for OSHA 10 Compliance

Article 8 §220-h requires that when the advertised specifications, for every contract for public work, is \$250,000.00 or more the contract must contain a provision requiring that every worker employed in the performance of a public work contract shall be certified as having completed an OSHA 10 safety training course. The clear intent of this provision is to require that all employees of public work contractors, required to be paid prevailing rates, receive such training "prior to the performing any work on the project."

The Bureau will enforce the statute as follows:

All contractors and sub contractors must attach a copy of proof of completion of the OSHA 10 course to the first certified payroll submitted to the contracting agency and on each succeeding payroll where any new or additional employee is first listed.

Proof of completion may include but is not limited to:

- Copies of bona fide course completion card (*Note: Completion cards do not have an expiration date.*)
- Training roster, attendance record or other documentation from the certified trainer pending the issuance of the card.
- Other valid proof

**A certification by the employer attesting that all employees have completed such a course is not sufficient proof that the course has been completed.

Any questions regarding this statute may be directed to the New York State Department of Labor, Bureau of Public Work at 518-457-5589.

WICKS

Public work projects are subject to the Wicks Law requiring separate specifications and bidding for the plumbing, heating and electrical work, when the total project's threshold is \$3 million in Bronx, Kings, New York, Queens and, Richmond counties; \$1.5 million in Nassau, Suffolk and Westchester counties; and \$500,000 in all other counties.

For projects below the monetary threshold, bidders must submit a sealed list naming each subcontractor for the plumbing, HVAC and electrical and the amount to be paid to each. The list may not be changed unless the public owner finds a legitimate construction need, including a change in specifications or costs or the use of a Project Labor Agreement (PLA), and must be open to public inspection.

Allows the state and local agencies and authorities to waive the Wicks Law and use a PLA if it will provide the best work at the lowest possible price. If a PLA is used, all contractors shall participate in apprentice training programs in the trades of work it employs that have been approved by the Department of Labor (DOL) for not less than three years. They shall also have at least one graduate in the last three years and use affirmative efforts to retain minority apprentices. PLA's would be exempt from Wicks, but deemed to be public work subject to prevailing wage enforcement.

The Commissioner of Labor shall have the power to enforce separate specification requirements on projects, and may issue stop-bid orders against public owners for non-compliance.

Other new monetary thresholds, and similar sealed bidding for non-Wicks projects, would apply to certain public authorities including municipal housing authorities, NYC Construction Fund, Yonkers Educational Construction Fund, NYC Municipal Water Finance Authority, Buffalo Municipal Water Finance Authority, Westchester County Health Care Association, Nassau County Health Care Corp., Clifton-Fine Health Care Corp., Erie County Medical Center Corp., NYC Solid Waste Management Facilities, and the Dormitory Authority.

Contractors must pay subcontractors within a 7 days period.

(07.19)

Introduction to the Prevailing Rate Schedule

Information About Prevailing Rate Schedule

This information is provided to assist you in the interpretation of particular requirements for each classification of worker contained in the attached Schedule of Prevailing Rates.

Classification

It is the duty of the Commissioner of Labor to make the proper classification of workers taking into account whether the work is heavy and highway, building, sewer and water, tunnel work, or residential, and to make a determination of wages and supplements to be paid or provided. It is the responsibility of the public work contractor to use the proper rate. If there is a question on the proper classification to be used, please call the district office located nearest the project. District office locations and phone numbers are listed below.

Prevailing Wage Schedules are issued separately for "General Construction Projects" and "Residential Construction Projects" on a county-by-county basis.

General Construction Rates apply to projects such as: Buildings, Heavy & Highway, and Tunnel and Water & Sewer rates.

Residential Construction Rates generally apply to construction, reconstruction, repair, alteration, or demolition of one family, two family, row housing, or rental type units intended for residential use.

Some rates listed in the Residential Construction Rate Schedule have a very limited applicability listed along with the rate. Rates for occupations or locations not shown on the residential schedule must be obtained from the General Construction Rate Schedule. Please contact the local Bureau of Public Work office before using Residential Rate Schedules, to ensure that the project meets the required criteria.

Payrolls and Payroll Records

Contractors and subcontractors are required to establish, maintain, and preserve for not less than six (6) years, contemporaneous, true, and accurate payroll records.

Every contractor and subcontractor shall submit to the Department of Jurisdiction (Contracting Agency), within thirty (30) days after issuance of its first payroll and every thirty (30) days thereafter, a transcript of the original payrolls, subscribed and affirmed as true under penalty of perjury.

Paid Holidays

Paid Holidays are days for which an eligible employee receives a regular day's pay, but is not required to perform work. If an employee works on a day listed as a paid holiday, this remuneration is in addition to payment of the required prevailing rate for the work actually performed.

Overtime

At a minimum, all work performed on a public work project in excess of eight hours in any one day or more than five days in any workweek is overtime. However, the specific overtime requirements for each trade or occupation on a public work project may differ. Specific overtime requirements for each trade or occupation are contained in the prevailing rate schedules.

Overtime holiday pay is the premium pay that is required for work performed on specified holidays. It is only required where the employee actually performs work on such holidays.

The applicable holidays are listed under HOLIDAYS: OVERTIME. The required rate of pay for these covered holidays can be found in the OVERTIME PAY section listings for each classification.

Supplemental Benefits

Particular attention should be given to the supplemental benefit requirements. Although in most cases the payment or provision of supplements is straight time for all hours worked, some classifications require the payment or provision of supplements, or a portion of the supplements, to be paid or provided at a premium rate for premium hours worked. Supplements may also be required to be paid or provided on paid holidays, regardless of whether the day is worked. The Overtime Codes and Notes listed on the particular wage classification will indicate these conditions as required.

Effective Dates

When you review the schedule for a particular occupation, your attention should be directed to the dates above the column of rates. These are the dates for which a given set of rates is effective. The rate listed is valid until the next effective rate change or until the new annual determination which takes effect on July 1 of each year. All contractors and subcontractors are required to pay the current prevailing rates of wages and supplements. If you have any questions please contact the Bureau of Public Work or visit the New York State Department of Labor website (www.labor.ny.gov) for current wage rate information.

Apprentice Training Ratios

The following are the allowable ratios of registered Apprentices to Journey-workers.

For example, the ratio 1:1,1:3 indicates the allowable initial ratio is one Apprentice to one Journeyworker. The Journeyworker must be in place on the project before an Apprentice is allowed. Then three additional Journeyworkers are needed before a second Apprentice is allowed. The last ratio repeats indefinitely. Therefore, three more Journeyworkers must be present before a third Apprentice can be hired, and so on.

Please call Apprentice Training Central Office at (518) 457-6820 if you have any questions.

Title (Trade)	Ratio
Boilermaker (Construction)	1:1,1:4
Boilermaker (Shop)	1:1,1:3
Carpenter (Bldg.,H&H, Pile Driver/Dockbuilder)	1:1,1:4
Carpenter (Residential)	1:1,1:3
Electrical (Outside) Lineman	1:1,1:2
Electrician (Inside)	1:1,1:3
Elevator/Escalator Construction & Modernizer	1:1,1:2
Glazier	1:1,1:3
Insulation & Asbestos Worker	1:1,1:3
Iron Worker	1:1,1:4
Laborer	1:1,1:3
Mason	1:1,1:4
Millwright	1:1,1:4
Op Engineer	1:1,1:5
Painter	1:1,1:3
Plumber & Steamfitter	1:1,1:3
Roofer	1:1,1:2
Sheet Metal Worker	1:1,1:3
Sprinkler Fitter	1:1,1:2

If you have any questions concerning the attached schedule or would like additional information, please contact the nearest BUREAU of PUBLIC WORK District Office or write to:

New York State Department of Labor
 Bureau of Public Work
 State Office Campus, Bldg. 12
 Albany, NY 12240

District Office Locations:	Telephone #	FAX #
Bureau of Public Work - Albany	518-457-2744	518-485-0240
Bureau of Public Work - Binghamton	607-721-8005	607-721-8004
Bureau of Public Work - Buffalo	716-847-7159	716-847-7650
Bureau of Public Work - Garden City	516-228-3915	516-794-3518
Bureau of Public Work - Newburgh	845-568-5287	845-568-5332
Bureau of Public Work - New York City	212-932-2419	212-775-3579
Bureau of Public Work - Patchogue	631-687-4882	631-687-4902
Bureau of Public Work - Rochester	585-258-4505	585-258-4708
Bureau of Public Work - Syracuse	315-428-4056	315-428-4671
Bureau of Public Work - Utica	315-793-2314	315-793-2514
Bureau of Public Work - White Plains	914-997-9507	914-997-9523
Bureau of Public Work - Central Office	518-457-5589	518-485-1870

Westchester County General Construction

Boilermaker **08/01/2022**

JOB DESCRIPTION Boilermaker

DISTRICT 4

ENTIRE COUNTIES

Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester

WAGES

Per Hour: 07/01/2022

Boilermaker \$ 63.38
Repairs & Renovations 63.38

SUPPLEMENTAL BENEFITS

Per Hour:

Boilermaker 32% of hourly
Repair \$ Renovations Wage Paid
+ \$ 25.38

NOTE: "Hourly Wage Paid" shall include any and all premium(s) pay.

Repairs & Renovation Includes replacement of parts and repairs & renovation of existing unit.

OVERTIME PAY

See (D, O) on OVERTIME PAGE
Repairs & Renovation see (B,E,Q)

HOLIDAY

Paid: See (8, 16, 23, 24) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 12, 15, 16, 22, 23, 24, 25) on HOLIDAY PAGE

NOTE: *Employee must work in pay week to receive Holiday Pay.
**Employee gets 4 times the hourly wage rate for working Labor Day.

REGISTERED APPRENTICES

Wage per hour:
(1/2) Year Terms at the following percentage of Boilermaker's Wage

1st	2nd	3rd	4th	5th	6th	7th
65%	70%	75%	80%	85%	90%	95%

Supplemental Benefits Per Hour:

Apprentice(s) 32% of Hourly
Wage Paid Plus
Amount Below

1st Term	\$ 19.41
2nd Term	20.26
3rd Term	21.11
4th Term	21.96
5th Term	22.82
6th Term	23.68
7th Term	24.52

NOTE: "Hourly Wage Paid" shall include any and all premium(s)

4-5

Carpenter **08/01/2022**

JOB DESCRIPTION Carpenter

DISTRICT 8

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES

Per hour: 07/01/2022

Piledriver \$ 58.16
+ 9.54*

Dockbuilder \$ 58.16
 + 9.54*

*This portion is not subject to overtime premiums

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker \$ 44.54

OVERTIME PAY

See (B, E2, O) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE.

Paid: for 1st & 2nd yr.

Apprentices See (5,6,11,13,25)

Overtime: See (5,6,11,13,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES

Wages per hour

(1)year terms:

	1st	2nd	3rd	4th
	\$24.60	\$30.20	\$38.58	\$46.97
	+ 5.05*	+ 5.05*	+ 5.05*	+ 5.05*

*This portion is not subject to overtime premiums

Supplemental benefits per hour:

All Terms: \$ 31.03

8-1556 Db

Carpenter

08/01/2022

JOB DESCRIPTION Carpenter

DISTRICT 8

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES

Per hour: 07/01/2022

Carpet/Resilient

Floor Coverer \$ 55.05
 + 8.25*

*This portion is not subject to overtime premiums

INCLUDES HANDLING & INSTALLATION OF ARTIFICIAL TURF AND SIMILAR TURF INDOORS/OUTDOORS.

SUPPLEMENTAL BENEFITS

Per hour:

\$ 39.40

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (18, 19) on HOLIDAY PAGE.

Paid for 1st & 2nd yr.

Apprentices See (5,6,11,13,16,18,19,25)

Overtime: See (5,6,11,13,16,18,19,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES

Wage per hour - (1) year terms:

	1st	2nd	3rd	4th
	\$ 24.80	\$ 27.80	\$ 32.05	\$ 39.93
	+ 1.85*	+ 2.35*	+ 2.85*	+ 3.85*

*This portion is not subject to overtime premiums

Supplemental benefits per hour:

1st	2nd	3rd	4th
\$ 14.80	\$ 15.80	\$ 18.90	\$ 19.90

8-2287

Carpenter

08/01/2022

JOB DESCRIPTION Carpenter

DISTRICT 8

ENTIRE COUNTIES

Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES

Per Hour: 07/01/2022

Marine Construction:

Marine Diver \$ 73.03
+ 9.54*

Marine Tender \$ 62.11
+ 9.54*

*This portion is not subject to overtime premiums

SUPPLEMENTAL BENEFITS

Per Hour:

Journeyworker \$ 44.54

OVERTIME PAY

See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (18, 19) on HOLIDAY PAGE

Overtime: See (5, 6, 10, 11, 13, 16, 18, 19) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wages per hour:

One (1) year terms.

1st year	\$ 24.60 + 5.05*
2nd year	30.20 + 5.05*
3rd year	38.58 + 5.05*
4th year	56.97 + 5.05*

*This portion is not subject to overtime premiums

Supplemental Benefits

Per Hour:

All terms \$ 31.03

8-1456MC

Carpenter

08/01/2022

JOB DESCRIPTION Carpenter

DISTRICT 8

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES

Per hour: 07/01/2022

Building
Millwright \$ 57.80
+ 12.62*

*This portion is not subject to overtime premiums

SUPPLEMENTAL BENEFITS

Per hour:

Millwright \$ 43.16

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (18,19) on HOLIDAY PAGE.

Overtime See (5,6,8,11,13,18,19,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES

Wages per hour:

One (1) year terms:

1st.	2nd.	3rd.	4th.
\$31.24	\$36.69	\$42.14	\$53.04
+ 6.75*	+ 7.92*	+ 9.09*	+ 11.43*

*This portion is not subject to overtime premiums

Supplemental benefits per hour:

One (1) year terms:

1st.	2nd.	3rd.	4th.
\$29.01	\$31.54	\$34.72	\$39.14

8-740.1

Carpenter

08/01/2022

JOB DESCRIPTION Carpenter

DISTRICT 8

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per Hour:

07/01/2022

Timberman \$ 53.05
+ 10.01*

*This portion not subject to overtime premiums

SUPPLEMENTAL BENEFITS

Per Hour:

07/01/2022

\$ 43.75

OVERTIME PAY

See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE.

Paid: for 1st & 2nd yr.

Apprentices See (5,6,11,13,25)

Overtime: See (5,6,11,13,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES

Wages per hour:

One (1) year terms:

1st	2nd	3rd	4th
\$22.42	\$27.53	\$35.18	\$42.84
+ 5.30*	+ 5.30*	+ 5.30*	+5.30*

*This portion is not subject to overtime premiums

Supplemental benefits per hour:

All terms \$ 30.74

8-1556 Tm

Carpenter **08/01/2022**

JOB DESCRIPTION Carpenter

DISTRICT 8

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Westchester

PARTIAL COUNTIES

Orange: South of but including the following, Waterloo Mills, Slate Hill, New Hampton, Goshen, Blooming Grove, Mountainville, east to the Hudson River.

Putnam: South of but including the following, Cold Spring, TompkinsCorner, Mahopac, Croton Falls, east to Connecticut border.

Suffolk: West of Port Jefferson and Patchogue Road to Route 112 to the Atlantic Ocean.

WAGES

Per hour: 07/01/2022 10/18/2022

Core Drilling:

Driller	\$ 42.27	\$ 43.38	
	+ 2.30*	+ 2.50*	

Driller Helper

	33.47	34.47	
	+ 2.30*	+ 2.50*	

Note: Hazardous Waste Pay Differential:

For Level C, an additional 15% above wage rate per hour

For Level B, an additional 15% above wage rate per hour

For Level A, an additional 15% above wage rate per hour

Note: When required to work on water: an additional \$ 3.00 per hour.

*This portion is not subject to overtime premiums

SUPPLEMENTAL BENEFITS

Per hour:

Driller and Helper	\$ 28.30	\$ 28.85	
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OVERTIME PAY

See (B, G, P) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6) on HOLIDAY PAGE

Overtime: See (5, 6) on HOLIDAY PAGE

8-1536-CoreDriller

Carpenter - Building / Heavy&Highway **08/01/2022**

JOB DESCRIPTION Carpenter - Building / Heavy&Highway

DISTRICT 11

ENTIRE COUNTIES

Putnam, Rockland, Westchester

WAGES

WAGES:(per hour)

Applies to CAPRENTER BUILDING/HEAVY & HIGHWAY/TUNNEL:

	07/01/2022	07/01/2023	07/01/2024	07/01/2025
Base Wage	\$ 38.95	\$ 1.25**	\$ 1.25**	\$ 1.25**
	+\$6.65*			

*For all hours paid straight or premium.

**To be allocated at a later date.

SHIFT DIFFERENTIAL: When it is mandated by a Government Agency irregular or off shift can be worked. The Carpenter shall receive an additional fifteen percent (15%) of wage plus applicable benefits.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker	\$ 32.88	
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OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

BUILDING:

Paid: See (1) on HOLIDAY PAGE.
 Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE.
 - Holidays that fall on Sunday will be observed Monday.

HEAVY&HIGHWAY/TUNNEL:

Paid: See (5, 6, 25) on HOLIDAY PAGE
 Overtime: See (5, 6) on HOLIDAY PAGE
 - Holidays that fall on Sunday will be observed Monday
 - Must be employed during the five (5) work days immediately preceding a holiday or during the five (5) work days following the paid holiday to receive holiday pay
 - If Employee is entitled to a paid holiday, the Employee is paid the Holiday wage and supplemental benefits whether they work or not. If Employee works the Holiday, the Employee will receive holiday pay (including supplemental benefits), plus the applicable premium wage for working the Holiday. If Employee works in excess of 8 hours on Holiday, then benefits will be paid for any hours in excess of 8 hours.

REGISTERED APPRENTICES

1 year terms at the following wage rates:

1st	2nd	3rd	4th	5th
\$ 19.48	\$ 23.37	\$ 25.32	\$ 27.27	\$ 31.16
+3.57*	+3.57*	+3.57*	+3.57*	+3.57*

*For all hours paid straight or premium

SUPPLEMENTAL BENEFITS per hour:

All terms \$ 16.28

11-279.1B/HH

Electrician **08/01/2022**

JOB DESCRIPTION Electrician **DISTRICT 9**

ENTIRE COUNTIES
 Bronx, Kings, New York, Queens, Richmond, Westchester

WAGES

Per hour:	07/01/2022	03/09/2023
Service Technician	\$ 35.40	\$ 36.40

Service and Maintenance on Alarm and Security Systems.

Maintenance, repair and /or replacement of defective (or damaged) equipment on, but not limited to, Burglar - Fire - Security - CCTV - Card Access - Life Safety Systems and associated devices. (Whether by service contract of T&M by customer request.)

SUPPLEMENTAL BENEFITS

Per hour:		
Journeyworker:	\$ 20.18	\$ 21.07

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 11, 15, 16, 17, 25, 26) on HOLIDAY PAGE
 Overtime: See (5, 6, 11, 15, 16, 17, 25, 26) on HOLIDAY PAGE

9-3H

Electrician **08/01/2022**

JOB DESCRIPTION Electrician **DISTRICT 8**

ENTIRE COUNTIES
 Westchester

WAGES

Per hour:	07/01/2022
*Electrician/A-Technician	\$ 53.75
Teledata	53.75

*All new installations of wiring, conduit, junction boxes and light fixtures for projects with a base bid of more than \$325,000. For projects with a base bid of \$325,000 or less, see Maintenance and Repair rates.

Note: On a job where employees are required to work on bridges over navigable waters, transmission towers, light poles, bosun chairs, swinging scaffolds , etc. 40 feet or more above the water or ground or under compressed air, or tunnel projects under construction or where assisted breathing apparatus is required, they will be paid at the rate of time and one-half for such work except on normal pole line or building construction work.

SUPPLEMENTAL BENEFITS

Per hour:
 Journeyworker \$ 54.39

OVERTIME PAY

See (A, G, *J, P) on OVERTIME PAGE

*NOTE: Emergency work on Sunday and Holidays is at the time and one-half overtime rate.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

(1) year terms at the following wage rates:

	07/01/2022
1st term	\$ 15.00
2nd term	16.00
3rd term	18.00
4th term	20.00
MIJ 1-12 months	25.00
MIJ 13-18 months	28.50

Supplemental Benefits per hour:

	07/01/2022
1st term	\$ 10.82
2nd term	13.05
3rd term	14.39
4th term	15.72
MIJ 1-12 months	13.49
MIJ 13-18 months	13.87

8-3/W

Electrician

08/01/2022

JOB DESCRIPTION Electrician

DISTRICT 8

ENTIRE COUNTIES

Westchester

WAGES

Per hour	07/01/2022
Electrician -M	\$ 28.50
H - Telephone	28.50

All work with a base bid amount of \$325,000 or less. Including repairs and /or replacement of defective electrical and teledata equipment, 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.

*If the project exceeds \$375,000 due to changes in the scope of work, an Electrician/A Technician must be part of the labor ratio.

SUPPLEMENTAL BENEFITS

	07/01/2022
Electrician & H - Telephone	\$ 13.87

OVERTIME PAY

See (B, G, *J, P) on OVERTIME PAGE

*Note: Emergency work on Sunday and Holidays is at the time and one-half overtime rate.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

8-3m

Elevator Constructor

08/01/2022

JOB DESCRIPTION Elevator Constructor

DISTRICT 4

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

PARTIAL COUNTIES

Rockland: Entire County except for the Township of Stony Point

Westchester: Entire County except for the Townships of Bedford, Lewisboro, Cortland, Mt. Kisco, North Salem, Pound Ridge, Somers and Yorktown.

WAGES

Per hour:

07/01/2022 03/17/2023

Elevator Constructor \$ 75.14 \$ 77.49

Modernization & Service/Repair 59.09 60.89

Four(4), ten(10) hour days may be worked at straight time during a week, Monday thru Friday.

NOTE- In order to use the '4 Day/10 Hour Work Schedule', as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule' form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 IS NOT SUBMITTED you will be liable for overtime payments for work over the allotted hours per day listed.

SUPPLEMENTAL BENEFITS

Per Hour:

Elevator Constructor \$ 43.914 \$ 45.574

Modernization & Service/Repairs 42.787 44.412

OVERTIME PAY

Constructor See (D, M, T) on OVERTIME PAGE.

Modern/Service See (B, F, S) on OVERTIME PAGE.

HOLIDAY

Paid: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

WAGES PER HOUR:

*Note:1st, 2nd, 3rd Terms are based on Average wage of Constructor & Modernization.

Terms 4 thru 9 Based on Journeyman's wage of classification Working in.

6 MONTH TERMS:

1st Term* 50%	2nd & 3rd Term* 50%	4th & 5th Term 55%	6th & 7th Term 65%	8th & 9th Term 75%
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SUPPLEMENTAL BENEFITS

Elevator Constructor

1st Term \$ 0.00 \$ 0.00

2nd & 3rd Term 34.772 36.024

4th & 5th Term 35.606 36.943

6th & 7th Term 37.052 38.448

8th & 9th Term 38.497 39.953

Modernization & Service/Repair

1st Term \$ 0.00 \$ 0.00

2nd & 3rd Term 34.672 35.694

4th & 5th Term 35.195 36.525

6th & 7th Term 36.571 37.948

8th & 9th Term 37.938 39.38

JOB DESCRIPTION Elevator Constructor

DISTRICT 1

ENTIRE COUNTIES

Columbia, Dutchess, Greene, Orange, Putnam, Sullivan, Ulster

PARTIAL COUNTIES

Delaware: Towns of Andes, Bovina, Colchester, Davenport, Delhi, Harpersfield, Hemdon, Kortright, Meredith, Middletown, Roxbury, Hancock & Stamford

Rockland: Only the Township of Stony Point.

Westchester: Only the Townships of Bedford, Lewisboro, Cortland, Mt. Kisco, North Salem, Pound Ridge, Somers and Yorktown.

WAGES

Per Hour	07/01/2022	01/01/2023
Mechanic	\$ 64.63	\$ 67.35
Helper	70% of Mechanic Wage Rate	70% of Mechanic Wage Rate

Four (4), ten (10) hour days may be worked for New Construction and Modernization Work at straight time during a week, Monday thru Thursday or Tuesday thru Friday.

***Four (4), ten (10) hour days are not permitted for Contract Work/Repair Work

NOTE - In order to use the '4 Day/10 Hour Work Schedule' as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule', form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

SUPPLEMENTAL BENEFITS

Per hour	07/01/2022	01/01/2023
Journeyman/Helper	\$ 36.885*	\$ 37.335*

(*)Plus 6% of regular hourly if less than 5 years of service. Plus 8% of regular hourly rate if more than 5 years of service.

OVERTIME PAY

See (D, O) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 15, 16) on HOLIDAY PAGE

Overtime: See (5, 6, 15, 16) on HOLIDAY PAGE

Note: When a paid holiday falls on Saturday, it shall be observed on Friday. When a paid holiday falls on Sunday, it shall be observed on Monday.

REGISTERED APPRENTICES

Wages per hour:				
0-6 mo*	6-12 mo	2nd yr	3rd yr	4th yr
50 %	55 %	65 %	70 %	80 %

(*)Plus 6% of the hourly rate, no additional supplemental benefits.

Supplemental Benefits per hour worked:

Same as Journeyman/Helper

1-138

Glazier

08/01/2022

JOB DESCRIPTION Glazier

DISTRICT 8

ENTIRE COUNTIES

Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester

WAGES

Per hour:	7/01/2022	11/01/2022
Glazier	\$ 59.59	Additional \$ 1.25
*Scaffolding	61.55	
Glass Tinting & Window Film	30.11	
**Repair & Maintenance	30.11	

*Scaffolding includes swing scaffold, mechanical equipment, scissor jacks, man lifts, booms & buckets 24' or more, but not pipe scaffolding.

**Repair & Maintenance- All repair & maintenance work on a particular building whenever performed, where the total cumulative contract value is under \$148,837. All Glass tinting, window film, regardless of material or intended use, and all affixing of decals to windows or glass.

SUPPLEMENTAL BENEFITS

Per hour:	7/01/2022
Journeyworker	\$ 37.55
Glass tinting & Window Film	22.01
Repair & Maintenance	22.01

OVERTIME PAY

See (B,H,V) on OVERTIME PAGE.
 For 'Repair & Maintenance' and 'Glass Tinting & Window Film' see (B, B2, I, S) on overtime page.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (4, 6, 16, 25) on HOLIDAY PAGE
 For 'Repair & Maintenance' and 'Glass Tinting & Window Film' Only
 Paid: See(5, 6, 16, 25)
 Overtime: See(5, 6, 16, 25)

REGISTERED APPRENTICES

Wage per hour:		
(1) year terms at the following wage rates:	7/01/2022	11/01/2022
1st term	\$ 21.15	TBD
2nd term	29.07	
3rd term	35.20	
4th term	47.38	

Supplemental Benefits:	
(Per hour)	
1st term	\$ 17.15
2nd term	24.42
3rd term	27.06
4th term	32.15

8-1087 (DC9 NYC)

Insulator - Heat & Frost	08/01/2022
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JOB DESCRIPTION Insulator - Heat & Frost **DISTRICT 8**

ENTIRE COUNTIES
 Dutchess, Orange, Putnam, Rockland, Westchester

WAGES		
Per hour:	07/01/2022	05/31/2023
Insulator	\$ 58.25	+ \$ 2.00
Discomfort & Additional Training**	61.30	+ \$ 2.00
Fire Stop Work*	31.15	+ \$ 2.00

* Applies on all exclusive Fire Stop Work (When contract is for Fire Stop work only). No apprentices on these contracts only.

**Applies to work requiring; garb or equipment worn against the body not customarily worn by insulators;psychological evaluation;special training, including but not limited to "Yellow Badge" radiation training

Note: Additional \$0.50 per hour for work 30 feet or more above floor or ground level.

SUPPLEMENTAL BENEFITS

Per hour:	
Journeyworker	\$ 36.10
Discomfort &	

Additional Training 38.09
 Fire Stop Work:
 Journeyworker 18.41

OVERTIME PAY

See (B, E, E2, Q, *T) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Note: Last working day preceding Christmas and New Years day, workers shall work no later than 12:00 noon and shall receive 8 hrs pay.

Overtime: See (2*, 4, 6, 16, 25) on HOLIDAY PAGE.

*Note: Labor Day triple time if worked.

REGISTERED APPRENTICES

(1) year terms:

Insulator Apprentices:

1st	2nd	3rd	4th
\$ 31.15	\$ 36.56	\$ 41.98	\$ 47.41

Discomfort & Additional Training Apprentices:

1st	2nd	3rd	4th
\$ 32.67	\$ 38.39	\$ 44.12	\$ 49.85

Supplemental Benefits paid per hour:

Insulator Apprentices:

1st term	\$ 18.41
2nd term	21.94
3rd term	25.48
4th term	29.03

Discomfort & Additional Training Apprentices:

1st term	\$ 19.41
2nd term	23.14
3rd term	26.88
4th term	30.62

8-91

Ironworker

08/01/2022

JOB DESCRIPTION Ironworker

DISTRICT 9

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per Hour:	07/01/2022	01/01/2023
		Additional
Stone Derrickmen Rigger	\$ 72.26	+ \$ 1.64
Stone Handset Derrickman	70.11	+ \$ 1.11

SUPPLEMENTAL BENEFITS

Per hour:

Stone Derrickmen Rigger	\$ 42.10
Stone Handset Derrickman	42.09

OVERTIME PAY

See (B, D1, *E, Q, **V) on OVERTIME PAGE

*Time and one-half shall be paid for all work on Saturday up to eight (8) hours and double time shall be paid for all work thereafter.

** Benefits same premium as wages on Holidays only

HOLIDAY

Paid: See (18) on HOLIDAY PAGE

Overtime: See (5, 6, 8, 25) on HOLIDAY PAGE

Work stops at schedule lunch break with full day's pay.

REGISTERED APPRENTICES

Wage per hour:

Stone Derrickmen Rigger:

	1st	2nd	3rd	4th
07/01/2022	\$ 35.58	\$ 50.89	\$ 56.71	\$ 62.48

Supplemental benefits:

Per hour:

07/01/2022	21.61	31.97	31.97	31.97
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Stone Handset:

1/2 year terms at the following hourly wage rate:

	1st	2nd	3rd	4th
07/01/2022	34.50	49.43	54.99	61.00

Supplemental benefits:

Per hour:

07/01/2022	21.60	31.96	31.96	31.96
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9-197D/R

Ironworker

08/01/2022

JOB DESCRIPTION Ironworker

DISTRICT 4

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per Hour:	07/01/2022	01/01/2023
Ornamental	\$ 46.65	Additional
Chain Link Fence	46.65	\$ 1.25
Guide Rail	46.65	

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker:	\$ 62.04
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OVERTIME PAY

See (B, B1, Q, V) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

Apprentices Hired after 9/1/18:

1 year terms

1st Term	\$ 20.63
2nd Term	24.22
3rd Term	27.80
4th Term	31.38

Supplemental Benefits per hour:

1st Term	\$ 17.90
2nd Term	19.15
3rd Term	20.41
4th Term	21.67

4-580-Or

Ironworker

08/01/2022

JOB DESCRIPTION Ironworker

DISTRICT 4

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

PER HOUR:

	07/01/2022	01/01/2023
Ironworker:		Additional
Structural	\$ 55.70	\$ 1.75

Bridges
Machinery

SUPPLEMENTAL BENEFITS

PER HOUR PAID:

Journeyman \$ 85.35

OVERTIME PAY

See (B, B1, Q, *V) on OVERTIME PAGE

*NOTE: Benefits are calculated for every hour paid

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 18, 19) on HOLIDAY PAGE

REGISTERED APPRENTICES

WAGES PER HOUR:

6 month terms at the following rate:

1st \$ 28.97
2nd 29.57
3rd - 6th 30.18

Supplemental Benefits

PER HOUR PAID:

All Terms \$ 59.18

4-40/361-Str

Ironworker

08/01/2022

JOB DESCRIPTION Ironworker

DISTRICT 4

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

PARTIAL COUNTIES

Rockland: Southern section - south of Convent Road and east of Blue Hills Road.

WAGES

Per hour: 07/01/2022 07/01/2023

Reinforcing & Metal Lathing \$ 56.90 Additional \$ 1.50

"Base" Wage \$ 55.20 plus \$ 1.70

"Base" Wage is used to calculate overtime hours only.

SUPPLEMENTAL BENEFITS

Per hour:

Reinforcing & Metal Lathing \$ 41.18

OVERTIME PAY

See (B, E, Q, *X) on OVERTIME PAGE

*Only \$23.50 per Hour for non worked hours

Supplemental Benefit Premiums for Overtime Hours worked:

Time & One Half \$ 47.68
Double Time \$ 54.18

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 11, 13, *18, **19, 25) on HOLIDAY PAGE

*Note: Work performed after first 4 Hours.

REGISTERED APPRENTICES

(1) year terms at the following wage rates:

1st term 2nd term 3rd term 4th Term

Wage Per Hour:

\$ 22.55	\$ 23.60	\$ 24.60	\$ 37.18
"Base" Wage			
\$ 21.00	\$ 22.00	\$ 23.00	\$ 35.60
plus \$1.55	plus \$1.60	plus \$1.60	plus \$1.58

"Base" Wage is used to calculate overtime hours ONLY.

SUPPLEMENTAL BENEFITS

Per Hour:

1st term	2nd term	3rd term	4th Term
\$ 18.17	\$ 17.17	\$ 16.22	\$ 22.50

4-46Reinf

Laborer - Building **08/01/2022**

JOB DESCRIPTION Laborer - Building

DISTRICT 8

ENTIRE COUNTIES

Putnam, Westchester

WAGES

Per hour 07/01/2022

Laborer \$ 39.05
plus \$5.45**

Laborer - Asbestos & Hazardous
 Materials Removal \$ 43.50*

* Abatement/Removal of:

- Lead based or lead containing paint on materials to be repainted is classified as Painter.
- Asbestos containing roofs and roofing material is classified as Roofer.

** This portion is not subject to overtime premium.

NOTE: Upgrade/Material condition work plan for work performed during non-outage under a wage formula of 90% wage/100% fringe benefits at nuclear power plants.

SUPPLEMENTAL BENEFITS

Per hour: 07/01/2022

Journeyworker \$ 29.50

OVERTIME PAY

See (B, E, E2, Q, *V) on OVERTIME PAGE

*Note: For Sundays and Holidays worked benefits are at the same premium as wages.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

LABORER ONLY

Hourly terms at the following wage:

Level A	Level B	Level C	Level D
0-1000	1001-2000	2001-3000	3001-4000
\$ 27.07	\$ 30.89	\$ 34.72	\$ 38.54

Supplemental Benefits per hour:

Apprentices
 All terms \$ 22.20

8-235/B

Laborer - Heavy&Highway **08/01/2022**

JOB DESCRIPTION Laborer - Heavy&Highway

DISTRICT 8

ENTIRE COUNTIES

Putnam, Westchester

WAGES

****PUTNAM: APPLIES TO ALL HEAVY & HIGHWAY WORK EXCLUDING HIGHWAYS, STREETS, AND BRIDGES****

GROUP I: Blaster, Quarry Master, Curbs/Asphalt Screedman, Pipe Jacking and Boring Operations Operator, Qualified Dead Condition Pipe Fuser (B Mechanic)

GROUP II: Burner, Drillers(jumbo, joy, wagon, air track, hydraulic), Drill Operator, Self Contained Rotary Drill, Curbs, Raker, Bar Person, Concrete Finisher.

GROUP III: Pavement Breakers, Jeeper Operator, Jack Hammer, Pneumatic Tools (all), Gas Driller, Guniting, Railroad Spike Puller, Pipelayer, Chain Saw, Deck winches on scows, Power Buggy Operator, Power Wheelbarrow Operator, Bar Person Helper, Compressed Air lance, Water Jet Lance.

GROUP IV: Concrete Laborers, Asph. Worker, Rock Scaler, Vibrator Oper., Bit Grinder, Air Tamper, Pumps, Epoxy (adhesives, fillers and troweled on), Barco Rammer, Concrete Grinder, Crack Router Operator, Guide Rail-digging holes and placing concrete and demolition when not to be replaced, distribution of materials and tightening of bolts.

GROUP V: Drillers Helpers, Common Laborer, Mason Tenders, Signal Person, Pit Person, Truck Spotter, Powder Person, Landscape/Nursery Person, Dump Person, Temp. Heat.

GROUP VIA: Asbestos/Toxic Waste Laborer-All removal (Roads, Tunnels, Landfills, etc.) Confined space laborer, Bio-remediation, Phyto-remediation, Lead or Hazardous material, Abatement Laborer.

Wages:(per hour)	07/01/2022
GROUP I	\$ 47.13*
GROUP II	45.78*
GROUP III	45.38*
GROUP IV	45.03*
GROUP V	44.68*
GROUP VIA	46.68*
Operator Qualified	
Gas Mechanic(A Mech)	57.13*
Flagperson	38.33*

*NOTE: To calculate overtime premiums, deduct \$0.10 from above wages

SHIFT WORK: A shift premium will be paid on Public Work contracts for off-shift or irregular shift work when mandated by the NYS D.O.T. or other Governmental Agency contracts. Employees shall receive an additional 15% per hour above current rate for all regular and irregular shift work. Premium pay shall be calculated using the 15% per hour differential as base rate.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker:

First 40 Hours	
Per Hour	\$ 26.82
Over 40 Hours	
Per Hour	20.32

OVERTIME PAY

See (B, E, P, R, S) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 8, 15, 25, 26) on HOLIDAY PAGE
 Overtime: See (5, 6, 8, 15, 25, 26) on HOLIDAY PAGE

NOTE: For Holiday Overtime: 5, 6 - Code 'S' applies
 For Holiday Overtime: 8, 15, 25, 26 - Code 'R' applies

REGISTERED APPRENTICES

	1st term	2nd term	3rd term	4th term
	1-1000hrs	1001-2000hrs	2001-3000hrs	3001-4000hrs
07/01/2022	\$ 25.37	\$ 29.94	\$ 34.51	\$ 38.98

Supplemental Benefits per hour:

1st term	\$ 4.70 - After 40 hours: \$ 4.45
2nd term	\$ 4.80 - After 40 hours: 4.45
3rd term	\$ 5.30 - After 40 hours: 4.85
4th term	\$ 5.85 - After 40 hours: 5.35

Laborer - Tunnel **08/01/2022**

JOB DESCRIPTION Laborer - Tunnel

DISTRICT 11

ENTIRE COUNTIES

Columbia, Dutchess, Greene, Orange, Otsego, Putnam, Rockland, Sullivan, Ulster, Westchester

PARTIAL COUNTIES

Chenango: Townships of Columbus, Sherburne and New Berlin.

Delaware: Townships of Andes, Bovina, Middletown, Roxbury, Franklin, Hamden, Stamford, Delhi, Kortright, Harpersfield, Merideth and Davenport.

WAGES

Class 1: All support laborers/sandhogs working above the shaft or tunnel.

Class 2: All laborers/sandhogs working in the shaft or tunnel.

Class 4: Safety Miners

Class 5: Site work related to Shaft/Tunnel

WAGES: (per hour)

	07/01/2022
Class 1	\$ 53.45
Class 2	55.60
Class 4	62.00
Class 5	44.80

Toxic and hazardous waste, lead abatement and asbestos abatement work will be paid an additional \$ 3.00 an hour.

SHIFT DIFFERENTIAL...On all Government mandated irregular shift work:

- Employee shall be paid at time and one half the regular rate Monday through Friday.
- Saturday shall be paid at 1.65 times the regular rate.
- Sunday shall be paid at 2.15 times the regular rate.

SUPPLEMENTAL BENEFITS

Per hour:

Benefit 1	\$ 34.45
Benefit 2	51.60
Benefit 3	68.75

Benefit 1 applies to straight time hours, paid holidays not worked.

Benefit 2 applies to over 8 hours in a day (M-F), irregular shift work hours worked, and Saturday hours worked.

Benefit 3 applies to Sunday and Holiday hours worked.

OVERTIME PAY

See (B, E, Q, X) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 15, 25) on HOLIDAY PAGE

Overtime: See (5, 6, 15, 16, 25) on HOLIDAY PAGE

When a recognized Holidays falls on Saturday or Sunday, holidays falling on Saturday shall be recognized or observed on Friday and holidays falling on Sunday shall be recognized or observed on Monday. Employees ordered to work on the Saturday or Sunday of the holiday or on the recognized or the observed Friday or Monday for those holidays falling on Saturday or Sunday shall receive double time the established rate and benefits for the holiday.

REGISTERED APPRENTICES

FOR APPRENTICE RATES, refer to the appropriate Laborer Heavy & Highway wage rate contained in the wage schedule for the County and location where the work is to be performed.

11-17/60/235/754Tun

Lineman Electrician **08/01/2022**

JOB DESCRIPTION Lineman Electrician

DISTRICT 6

ENTIRE COUNTIES

Westchester

WAGES

A Lineman/Technician shall perform all overhead aerial work. A Lineman/Technician on the ground will install all electrical panels, connect all grounds, install and connect all electrical conductors, assembly of all electrical materials, conduit, pipe or raceway; placing of fish wire; pulling of cables, wires or fiber optic cable through such raceways; splicing of conductors; dismantling of such structures, lines or equipment.

A Groundman/Truck Driver shall: Build and set concrete forms, handle steel mesh, set footer cages, transport concrete in a wheelbarrow, hand or machine concrete vibrator, finish concrete footers, mix mortar, grout pole bases, cover and maintain footers while curing in cold weather, operate jack hammer, operate hand pavement breaker, tamper, concrete and other motorized saws, as a drill helper, operate and maintain generators, water pumps, chainsaws, sand blasting, operate mulching and seeding machine, air tools, electric tools, gas tools, load and unload materials, hand shovel and/or broom, prepare and pour mastic and other fillers, assist digger operator equipment/operator in ground excavation and restoration, landscape work and painting. Only when assisting a lineman technician, a groundman/truck driver may assist in installing conduit, pipe, cables and equipment.

Below rates apply to electrical overhead and underground distribution and maintenance work and overhead and underground transmission line work, electrical substations, switching structures, continuous pipe-type underground fluid or gas filled transmission conduit and cable installations, maintenance jobs or projects, railroad catenary installations and maintenance, third rail installations, the bonding of rails and the installation of fiber optic cable. (Ref #14.04.01)

NOTE: Includes Teledata Work within ten (10) feet of High Voltage Transmission Lines. Also includes digging of holes for poles, anchors, footer, and foundations for electrical equipment.

Per hour:	07/01/2022	05/01/2023	05/06/2024
Lineman, Tech, Welder	\$ 59.01	\$ 60.41	\$ 61.91
Crane, Crawler Backhoe	59.01	60.41	61.91
Cable Splicer-Pipe Type	64.91	66.45	68.10
Digging Mach Operator	53.11	54.37	55.72
Cert. Welder-Pipe Type	61.96	63.43	65.01
Tractor Trailer Driver	50.16	51.35	52.62
Groundman, Truck Driver	47.21	48.33	49.53
Equipment Mechanic	47.21	48.33	49.53
Flagman	35.41	36.25	37.15

Additional \$1.00 per hour for entire crew when a helicopter is used.

NOTE: THE FOLLOWING RATES WILL APPLY ON ALL CONTRACTING AGENCY MANDATED MULTIPLE SHIFTS OF AT LEAST FIVE (5) DAYS DURATION WORKED BETWEEN THE HOURS LISTED BELOW:

1ST SHIFT	8:00 AM TO 4:30 PM REGULAR RATE
2ND SHIFT	4:30 PM TO 1:00 AM REGULAR RATE PLUS 17.3%
3RD SHIFT	12:30 AM TO 9:00 AM REGULAR RATE PLUS 31.4%

Four (4), ten (10) hour days may be worked at straight time during a week, Monday thru Thursday. Friday may be used as a make-up day. Tuesday thru Friday may be worked with no make-up day.

NOTE - In order to use the '4 Day/10 Hour Work schedule', as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule,' form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

SUPPLEMENTAL BENEFITS

Per hour worked (but also required on non-worked holidays):

	07/01/2022	05/01/2023	05/06/2024
Journeyman	\$ 25.90 *plus 7% of the hourly wage paid	\$ 26.40 *plus 7% of the hourly wage paid	\$ 26.90 *plus 7% of the hourly wage paid
Journeyman Lineman or Equipment Operators with Crane License	\$ 27.90 *plus 7% of the hourly wage paid	\$ 29.40 *plus 7% of the hourly wage paid	\$ 30.90 *plus 7% of the hourly wage paid

*The 7% is based on the hourly wage paid, straight time or premium time.

OVERTIME PAY

See (B, E, Q,) on OVERTIME PAGE. *Note* Double time for emergency work designated by the Dept of Jurisdiction.

NOTE: WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY

Paid See (5, 6, 8, 13, 25) on HOLIDAY PAGE plus Governor of NYS Election Day.
 Overtime See (5, 6, 8, 13, 25) on HOLIDAY PAGE plus Governor of NYS Election Day.

NOTE: All paid holidays falling on Saturday shall be observed on the preceding Friday. All paid holidays falling on Sunday shall be observed on the following Monday. Supplements for holidays paid at straight time.

REGISTERED APPRENTICES

WAGES per hour: 1000 hour terms at the following percentage of the applicable Journeyman Lineman wage.

1st	2nd	3rd	4th	5th	6th	7th
60%	65%	70%	75%	80%	85%	90%

SUPPLEMENTAL BENEFITS per hour:

07/01/2022	05/01/2023	05/06/2024
\$ 25.90	\$ 26.40	\$ 26.90
*plus 7% of the hourly wage paid	*plus 7% of the hourly wage paid	*plus 7% of the hourly wage paid

*The 7% is based on the hourly wage paid, straight time or premium time.

6-1249aWest

Lineman Electrician - Teledata

08/01/2022

JOB DESCRIPTION Lineman Electrician - Teledata

DISTRICT 6

ENTIRE COUNTIES

Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Rensselaer, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES

Per hour:

For outside work, stopping at first point of attachment (demarcation).

	07/01/2022	01/01/2023	01/01/2024	01/01/2025
Cable Splicer	\$ 36.28	\$ 37.73	\$ 39.24	\$ 40.81
Installer, Repairman	\$ 34.43	\$ 35.81	\$ 37.24	\$ 38.73
Teledata Lineman	\$ 34.43	\$ 35.81	\$ 37.24	\$ 38.73
Tech., Equip. Operator	\$ 34.43	\$ 35.81	\$ 37.24	\$ 38.73
Groundman	\$ 18.25	\$ 18.98	\$ 19.74	\$ 20.53

NOTE: EXCLUDES Teledata work within ten (10) feet of High Voltage (600 volts and over) transmission lines. For this work please see LINEMAN.

NOTE: THE FOLLOWING RATES WILL APPLY ON ALL CONTRACTING AGENCY MANDATED MULTIPLE SHIFTS OF AT LEAST FIVE (5) DAYS DURATION WORKED:

1ST SHIFT	REGULAR RATE
2ND SHIFT	REGULAR RATE PLUS 10%
3RD SHIFT	REGULAR RATE PLUS 15%

SUPPLEMENTAL BENEFITS

Per hour:	07/01/2022	01/01/2023	01/01/2024	01/01/2025
Journeyman	\$ 5.14	\$ 5.14	\$ 5.14	\$ 5.14
	*plus 3% of the hourly wage paid	*plus 3% of the hourly wage paid	*plus 3% of the hourly wage paid	*plus 3% of the hourly wage paid

*The 3% is based on the hourly wage paid, straight time rate or premium rate.

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

NOTE: WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 16) on HOLIDAY PAGE

6-1249LT - Teledata

Lineman Electrician - Traffic Signal, Lighting **08/01/2022**

JOB DESCRIPTION Lineman Electrician - Traffic Signal, Lighting

DISTRICT 6

ENTIRE COUNTIES
 Westchester

WAGES

Lineman/Technician shall perform all overhead aerial work. A Lineman/Technician on the ground will install all electrical panels, connect all grounds, install and connect all electrical conductors which includes, but is not limited to road loop wires; conduit and plastic or other type pipes that carry conductors, flex cables and connectors, and to oversee the encasement or burial of such conduits or pipes.

A Groundman/Groundman Truck Driver shall: Build and set concrete forms, handle steel mesh, set footer cages, transport concrete in a wheelbarrow, hand or machine concrete vibrator, finish concrete footers, mix mortar, grout pole bases, cover and maintain footers while curing in cold weather, operate jack hammer, operate hand pavement breaker, tamper, concrete and other motorized saws, as a drill helper, operate and maintain generators, water pumps, chainsaws, sand blasting, operate mulching and seeding machine, air tools, electric tools, gas tools, load and unload materials, hand shovel and/or broom, prepare and pour mastic and other fillers, assist digger operator/equipment operator in ground excavation and restoration, landscape work and painting. Only when assisting a lineman technician, a groundman/truck driver may assist in installing conduit, pipe, cables and equipment.

A flagger's duties shall consist of traffic control only.
 (Ref #14.01.03)

Per hour:	07/01/2022	05/01/2023	05/06/2024
Lineman, Technician	\$ 53.60	\$ 54.73	\$ 55.95
Crane, Crawler Backhoe	53.60	54.73	55.95
Certified Welder	56.28	57.47	58.75
Digging Machine	48.24	49.26	50.36
Tractor Trailer Driver	45.56	46.52	47.56
Groundman, Truck Driver	42.88	43.78	44.76
Equipment Mechanic	42.88	43.78	44.76
Flagman	32.16	32.84	33.57

Above rates are applicable for installation, testing, operation, maintenance and repair on all Traffic Control (Signal) and Illumination (Lighting) projects, Traffic Monitoring Systems, and Road Weather Information Systems. Includes digging of holes for poles, anchors, footer foundations for electrical equipment; assembly of all electrical materials or raceway; placing of fish wire; pulling of cables, wires or fiber optic cable through such raceways; splicing of conductors; dismantling of such structures, lines or equipment.

NOTE: THE FOLLOWING RATES WILL APPLY ON ALL CONTRACTING AGENCY MANDATED MULTIPLE SHIFTS OF AT LEAST FIVE (5) DAYS DURATION WORKED BETWEEN THE HOURS LISTED BELOW:

1ST SHIFT	8:00 AM TO 4:30 PM REGULAR RATE
2ND SHIFT	4:30 PM TO 1:00 AM REGULAR RATE PLUS 17.3%
3RD SHIFT	12:30 AM TO 9:00 AM REGULAR RATE PLUS 31.4%

Four (4), ten (10) hour days may be worked at straight time during a week, Monday thru Thursday. Friday may be used as a make-up day. Tuesday thru Friday may be worked with no make-up day.

NOTE - In order to use the '4 Day/10 Hour Work schedule', as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule,' form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

SUPPLEMENTAL BENEFITS

Per hour worked (but also required on non-worked holidays):

	07/01/2022	05/01/2023	05/06/2024
Journeyman	\$ 25.90	\$ 26.40	\$ 26.90
	*plus 7% of the hourly wage paid	*plus 7% of the hourly wage paid	*plus 7% of the hourly wage paid
Journeyman Lineman or Equipment Operators with Crane License	\$ 27.90	\$ 29.40	\$ 30.90
	*plus 7% of the hourly wage paid	*plus 7% of the hourly wage paid	*plus 7% of the hourly wage paid

*The 7% is based on the hourly wage paid, straight time or premium time.

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE. *Note* Double time for emergency work designated by the Dept. of Jurisdiction.
 NOTE: WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked.
 Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY

Paid: See (5, 6, 8, 13, 25) on HOLIDAY PAGE and Governor of NYS Election Day.
 Overtime: See (5, 6, 8, 13, 25) on HOLIDAY PAGE and Governor of NYS Election Day.

NOTE: All paid holidays falling on Saturday shall be observed on the preceding Friday. All paid holidays falling on Sunday shall be observed on the following Monday. Supplements for holidays paid at straight time.

REGISTERED APPRENTICES

WAGES per hour: 1000 hour terms at the following percentage of the applicable Journeyman Lineman wage.

1st	2nd	3rd	4th	5th	6th	7th
60%	65%	70%	75%	80%	85%	90%

SUPPLEMENTAL BENEFITS per hour:

	07/01/2022	05/01/2023	05/06/2024
	\$ 25.90	\$ 26.40	\$ 26.90
	*plus 7% of the hourly wage paid	*plus 7% of the hourly wage paid	*plus 7% of the hourly wage paid

*The 7% is based on the hourly wage paid, straight time or premium time.

6-1249aWestLT

Mason - Building

08/01/2022

JOB DESCRIPTION Mason - Building

DISTRICT 9

ENTIRE COUNTIES

Nassau, Rockland, Suffolk, Westchester

WAGES

Per hour:	07/01/2022	12/05/2022	06/05/2023
		Additional	Additional
Tile Setters	\$ 62.01	\$ 0.73	\$ 0.73

SUPPLEMENTAL BENEFITS

Per Hour:	\$ 26.13*
	+ \$10.02

* This portion of benefits subject to same premium rate as shown for overtime wages.

OVERTIME PAY

See (B, E, Q, V) on OVERTIME PAGE
 Work beyond 10 hours on Saturday shall be paid at double the hourly wage rate.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wage per hour:

(750 hour) term at the following wage rate:

Term:										
1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	
1-750	751-1500	1501-2250	2251-3000	3001-3750	3751-4500	4501-5250	5251-6000	6001-6750	6501-7000	
\$21.23	\$26.11	\$33.26	\$38.14	\$41.67	\$45.04	\$48.60	\$53.47	\$56.25	\$60.33	

Supplemental Benefits per hour:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$12.55*	\$12.55*	\$15.16*	\$15.16*	\$16.75*	\$18.30*	\$19.35*	\$19.40*	\$17.45*	\$22.80*

+\$.69 +\$.74 +\$.84 +\$.88 +\$1.28 +\$1.33 +\$1.70 +\$1.75 +\$5.90 +\$6.42

* This portion of benefits subject to same premium rate as shown for overtime wages.

9-7/52A

Mason - Building **08/01/2022**

JOB DESCRIPTION Mason - Building

DISTRICT 11

ENTIRE COUNTIES

Putnam, Rockland, Westchester

PARTIAL COUNTIES

Orange: Only the Township of Tuxedo.

WAGES

Per hour:

07/01/2022 06/01/2023

Bricklayer	\$ 44.79	\$ 45.89
Cement Mason	44.79	45.89
Plasterer/Stone Mason	44.79	45.89
Pointer/Caulker	44.79	45.89

Additional \$1.00 per hour for power saw work
 Additional \$0.50 per hour for swing scaffold or staging work

SHIFT WORK: When shift work or an irregular work day is mandated or required by state, federal, county, local or other governmental agency contracts, the following premiums apply:

- Irregular work day requires 15% premium
- Second shift an additional 15% of wage plus benefits to be paid
- Third shift an additional 25% of wage plus benefits to be paid

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman	\$ 37.00	\$ 37.95
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OVERTIME PAY

OVERTIME:

Cement Mason See (B, E, Q, W) on OVERTIME PAGE.
 All Others See (B, E, Q) on OVERTIME PAGE.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE

Whenever any of the above holidays fall on Sunday, they will be observed on Monday. Whenever any of the above holidays fall on Saturday, they will be observed on Friday.

REGISTERED APPRENTICES

Wages per hour:

750 hour terms at the following percentage of Journeyman's wage

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

Supplemental Benefits per hour

750 hour terms at the following percentage of journeyman supplements

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

Apprentices indentured before June 1st, 2011 receive full journeyman benefits

11-5wp-b

Mason - Building **08/01/2022**

JOB DESCRIPTION Mason - Building

DISTRICT 9

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Building	07/01/2022
Wages per hour:	
Mosaic & Terrazzo Mechanic	\$ 59.21
Mosaic & Terrazzo Finisher	57.60

SUPPLEMENTAL BENEFITS

Per hour:	
Mosaic & Terrazzo Mechanic	\$ 26.21* + \$11.73
Mosaic & Terrazzo Finisher	\$ 26.21* + \$11.72

*This portion of benefits subject to same premium rate as shown for overtime wages.

OVERTIME PAY

See (A, E, Q) on OVERTIME PAGE
 07/01/2022- Deduct \$7.00 from hourly wages before calculating overtime.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

Easter Sunday is an observed holiday. Holidays falling on a Saturday will be observed on that Saturday. Holidays falling on a Sunday will be celebrated on the Monday.

REGISTERED APPRENTICES

Wages Per hour:	1st	2nd	3rd	4th	5th	6th
	0- 1500	1501- 3000	3001- 3750	3751- 4500	4501- 5250	5251- 6000
	\$ 22.82	\$ 29.34	\$ 31.32	\$ 36.55	\$ 41.77	\$ 46.99

Supplemental Benefits per hour:						
	\$4.62*	\$5.94*	\$15.73*	\$18.35*	\$20.97*	\$23.59*
	+\$6.56	+\$8.43	+\$11.24	+\$13.11	+\$14.99	+\$16.85

*This portion of benefits subject to same premium rate as shown for overtime wages.

9-7/3

Mason - Building **08/01/2022**

JOB DESCRIPTION Mason - Building **DISTRICT 9**

ENTIRE COUNTIES
 Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES
 Per hour: 07/01/2022

Building-Marble Restoration:
 Marble, Stone & \$ 46.60

Terrazzo Polisher, etc
SUPPLEMENTAL BENEFITS

Per Hour:
 Journeyworker:

 Building-Marble Restoration:
 Marble, Stone &
 Polisher \$ 29.77

OVERTIME PAY
 See (B, *E, Q, V) on OVERTIME PAGE
 *ON SATURDAYS, 8TH HOUR AND SUCCESSIVE HOURS PAID AT DOUBLE HOURLY RATE.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 8, 11, 15, 25) on HOLIDAY PAGE
 1ST TERM APPRENTICE GETS PAID FOR ALL OBSERVED HOLIDAYS.

REGISTERED APPRENTICES

WAGES per hour:

900 hour term at the following wage:

1st 1- 900	2nd 901- 1800	3rd 1801- 2700	4th 2701
\$ 32.61	\$ 37.28	\$ 41.94	\$ 46.60

Supplemental Benefits Per Hour:

27.07	27.97	28.87	29.77
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9-7/24-MP

Mason - Building

08/01/2022

JOB DESCRIPTION Mason - Building

DISTRICT 9

ENTIRE COUNTIES

Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester

WAGES

Wages: 07/01/2022

Marble Cutters & Setters \$ 62.17

SUPPLEMENTAL BENEFITS

Per Hour:

Journeyworker \$ 38.27

OVERTIME PAY

See (B, E, Q, V) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wage Per Hour:

750 hour terms at the following wage.

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
1- 750	751- 1500	1501- 2250	2251- 3000	3001- 3750	3751- 4500	4501- 5250	5251- 6000	6001- 6751	6751- 7500
\$ 24.88	\$ 27.97	\$ 31.08	\$ 34.17	\$ 37.29	\$ 40.39	\$ 43.51	\$ 46.61	\$ 52.82	\$ 59.05

Supplemental Benefits per hour:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$ 20.55	\$ 22.04	\$ 23.52	\$ 25.01	\$ 26.47	\$ 27.96	\$ 29.42	\$ 30.91	\$ 33.86	\$ 36.81 9-7/4

Mason - Building

08/01/2022

JOB DESCRIPTION Mason - Building

DISTRICT 9

ENTIRE COUNTIES

Nassau, Rockland, Suffolk, Westchester

WAGES

Per hour: 07/01/2022 12/05/2022 06/05/2023
 Additional Additional

Tile Finisher \$ 47.60 \$ 0.59 \$ 0.58

SUPPLEMENTAL BENEFITS

Per Hour:
 \$ 22.16*
 + \$9.85

*This portion of benefits subject to same premium rate as shown for overtime wages

OVERTIME PAY

See (B, E, Q, *V) on OVERTIME PAGE

*Work beyond 10 hours on a Saturday shall be paid at double the hourly wage rate.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 11, 15, 16, 25) on HOLIDAY PAGE

9-7/88A-tf

Mason - Building

08/01/2022

JOB DESCRIPTION Mason - Building

DISTRICT 9

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour: 07/01/2022

Marble, Stone, etc.
 Maintenance Finishers: \$ 27.01

Note 1: An additional \$2.00 per hour
 for time spent grinding floor using
 "60 grit" and below.

Note 2: Flaming equipment operator
 shall be paid an additional \$25.00 per day.

SUPPLEMENTAL BENEFITS

Per Hour:
 Marble, Stone, etc
 Maintenance Finishers: \$ 14.40

OVERTIME PAY

See (B, *E, Q, V) on OVERTIME PAGE

*Double hourly rate after 8 hours on Saturday

HOLIDAY

Paid: See (5, 6, 8, 11, 15, 25) on HOLIDAY PAGE
 Overtime: See (5, 6, 8, 11, 15, 25) on HOLIDAY PAGE

1st term apprentice gets paid for all observed holidays.

REGISTERED APPRENTICES

WAGES per hour:
 07/01/2022

0-750	\$ 21.67
751-1500	22.38
1501-2250	23.10
2251-3000	23.80
3001-3750	24.87
3751-4500	26.29
4501+	27.01

Supplemental Benefits:

Per hour:

0-750	11.52
751-1500	11.90
1501-2250	12.29
2251-3000	12.67
3001-3750	13.25
3751-4500	14.01
4501+	14.40

Mason - Building / Heavy&Highway **08/01/2022**

JOB DESCRIPTION Mason - Building / Heavy&Highway **DISTRICT 9**

ENTIRE COUNTIES
 Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES
 Per hour: 07/01/2022

Marble-Finisher \$ 48.97

SUPPLEMENTAL BENEFITS

Journeyworker:
 per hour
 Marble- Finisher \$ 35.76

OVERTIME PAY
 See (B, E, Q, V) on OVERTIME PAGE
 Work beyond 8 hours on a Saturday shall be paid at double the rate.

HOLIDAY
 Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE
 When an observed holiday falls on a Sunday, it will be observed the next day.

Mason - Heavy&Highway **08/01/2022**

JOB DESCRIPTION Mason - Heavy&Highway **DISTRICT 11**

ENTIRE COUNTIES
 Putnam, Rockland, Westchester

PARTIAL COUNTIES
 Orange: Only the Township of Tuxedo.

WAGES
 Per hour:

	07/01/2022	06/01/2023
Bricklayer	\$ 45.29	\$ 46.39
Cement Mason	45.29	46.39
Marble/Stone Mason	45.29	46.39
Plasterer	45.29	46.39
Pointer/Caulker	45.29	46.39

Additional \$1.00 per hour for power saw work
 Additional \$0.50 per hour for swing scaffold or staging work

SHIFT WORK: When shift work or an irregular work day is mandated or required by state, federal, county, local or other governmental contracts, the following rates apply:
 Irregular work day requires 15% premium
 Second shift an additional 15% of wage plus benefits to be paid
 Third shift an additional 25% of wage plus benefits to be paid

SUPPLEMENTAL BENEFITS

Per hour:
 Journeyman \$ 37.00 \$ 37.95

OVERTIME PAY
 Cement Mason See (B, E, Q, W)
 All Others See (B, E, Q,)

HOLIDAY
 Paid: See (5, 6, 16, 25) on HOLIDAY PAGE
 Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE
 - Whenever any of the above holidays fall on Sunday, they will be observed on Monday. Whenever any of the above holidays fall on Saturday, they will be observed on Friday.
 - Supplemental Benefits are not paid for paid Holiday
 - If Holiday is worked, Supplemental Benefits are paid for hours worked.
 - Whenever an Employee works within three (3) calendar days before a holiday, the Employee shall be paid for the Holiday.

REGISTERED APPRENTICES

Wages per hour:

750 hour terms at the following percentage of Journeyman's wage

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

Supplemental Benefits per hour

750 hour terms at the following percentage of journeyman supplements

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

Apprentices indentured before June 1st, 2011 receive full journeyman benefits

11-5WP-H/H

Operating Engineer - Building

08/01/2022

JOB DESCRIPTION Operating Engineer - Building

DISTRICT 9

ENTIRE COUNTIES

Bronx, Kings, New York, Putnam, Queens, Richmond, Westchester

PARTIAL COUNTIES

Dutchess: that part of Dutchess County lying south of the North City Line of the City of Poughkeepsie.

WAGES

NOTE: Construction surveying

Party Chief--One who directs a survey party

Instrument Man--One who runs the instrument and assists Party Chief.

Rodman--One who holds the rod and assists the Survey Crew

Wages:(Per Hour) 07/01/2022

Building Construction:

Party Chief	\$ 76.64
Instrument Man	60.50
Rodman	40.64

Steel Erection:

Party Chief	79.41
Instrument Man	62.85
Rodman	43.48

Heavy Construction-NYC counties only:
 (Foundation, Excavation.)

Party Chief	84.60
Instrument man	63.79
Rodman	54.52

SUPPLEMENTAL BENEFITS

Per Hour: 07/01/2022

Building Construction	\$ 26.69* +\$ 7.40
Steel Erection	27.29* +\$ 7.40
Heavy Construction	25.25* +\$ 7.15

* This portion subject to same premium as wages

Non-Worked Holiday Supplemental Benefit:
 16.45

OVERTIME PAY

See (A, B, E, Q) on OVERTIME PAGE

Code "A" applies to Building Construction and has double the rate after 7 hours on Saturdays.

Code "B" applies to Heavy Construction and Steel Erection and had double the rate after 8 hours on Saturdays.

HOLIDAY

Paid: See (5, 6, 9, 11, 15, 16, 25) on HOLIDAY PAGE

Overtime: See (5, 6, 9, 11, 15, 16, 25) on HOLIDAY PAGE

9-15Db

Operating Engineer - Building

08/01/2022

JOB DESCRIPTION Operating Engineer - Building

DISTRICT 8

ENTIRE COUNTIES

Putnam, Westchester

PARTIAL COUNTIES

Dutchess: All the counties of Westchester and Putnam and the southern part of Dutchess County defined by the northern boundary line of the City of Poughkeepsie, then due east to Route 115, then north along Route 115 to Bedell Road, then east along Bedell Road to Van Wagner Road, then north along Van Wagner Road to Bower Road, then east along Bower Road to Route 44 and along Route 44 east to Route 343, then along Route 343 east to the northern boundary of Town of Dover Plains and east along the northern boundary of Town of Dover Plains to the border line of the State of Connecticut and bordered on the west by the middle of the Hudson River.

WAGES

GROUP I:

Cranes (All Types up to 49 tons), Boom Trucks, Cherry Pickers (All Types), Clamshell Crane, Derrick (Stone and Steel), Dragline, Franki Pile Rig or similar, High Lift (Lull or similar) with crane attachment and winch used for hoisting or lifting, Hydraulic Cranes, Pile Drivers, Potain and similar.

Cranes (All types 50-99 tons), Drill Rig Casa Grande (CAT or similar), Franki Pile Rig or similar, Hydraulic Cranes (All types including Crawler Cranes- No specific boom length).

Cranes (All types 100 tons and over), All Tower Cranes, All Climbing Cranes irrespective of manufacturer and regardless of how the same is rigged, Franki Pile Rig or similar, Conventional Cranes (All types including Crawler Cranes-No specific boom length), Hydraulic Cranes.

GROUP I-A: Barber Green Loader-Euclid Loader, Bulldozer, Carrier-Trailer Horse, Concrete Cleaning Decontamination Machine Operator, Concrete-Portable Hoist, Conway or Similar Mucking Machines, Elevator & Cage, Excavators all types, Front End Loaders, Gradall, Shovel, Backhoe, etc.(Crawler or Truck), Heavy Equipment Robotics Operator/Mechanic, Hoist Engineer-Material, Hoist Portable Mobile Unit, Hoist(Single, Double or Triple Drum), Horizontal Directional Drill Locator, Horizontal Directional Drill Operator and Jersey Spreader, Letourneau or Tournapull(Scrapers over 20 yards Struck), Lift Slab Console, etc., Lull HiLift or Similar, Master Environmental Maintenance Mechanics, Mucking Machines Operator/Mechanic or Similar Type, Overhead Crane, Pavement Breaker(Air Ram), Paver(Concrete), Post Hole Digger, Power House Plant, Road Boring Machine, Road Mix Machine, Ross Carrier and Similar Machines, Rubber tire double end backhoes and similar machines, Scoopmobile Tractor-Shovel Over 1.5 yards, Shovel (Tunnels), Spreader (Asphalt) Telephie(Cableway), Tractor Type Demolition Equipment, Trenching Machines-Vermeer Concrete Saw Trencher and Similar, Ultra High Pressure Waterjet Cutting Tool System, Vacuum Blasting Machine operator/mechanic, Winch Truck A Frame.

GROUP I-B: Compressor (Steel Erection), Mechanic (Outside All Types), Negative Air Machine (Asbestos Removal), Push Button (Buzz Box) Elevator.

GROUP II: Compactor Self-Propelled, Concrete Pump, Crane Operator in Training (Over 100 Tons), Grader, Machines Pulling Sheep's Foot Roller, Roller (4 ton and over), Scrapers (20 yards Struck and Under), Vibratory Rollers, Welder.

GROUP III-A: Asphalt Plant, Concrete Mixing Plants, Forklift (All power sources), Joy Drill or similar, Tractor Drilling Machine, Loader (1 1/2 yards and under), Portable Asphalt Plant, Portable Batch Plant, Portable Crusher, Skid Steer (Bobcat or similar), Stone Crusher, Well Drilling Machine, Well Point System.

GROUP III-B: Compressor Over 125 cu. Feet, Conveyor Belt Machine regardless of size, Compressor Plant, Ladder Hoist, Stud Machine.

GROUP IV-A: Batch Plant, Concrete Breaker, Concrete Spreader, Curb Cutter Machine, Finishing Machine-Concrete, Fine Grading Machine, Hepa Vac Clean Air Machine, Material Hopper(sand, stone, cement), Mulching Grass Spreader, Pump Gypsum etc, Pump-Plaster-Grout-Fireproofing. Roller(Under 4 Ton),Spreading and Fine Grading Machine, Steel Cutting Machine, Siphon Pump, Tar Joint Machine, Television Cameras for Water, Sewer, Gas etc. Turbo Jet Burner or Similar Equipment, Vibrator (1 to 5).

GROUP IV-B: Compressor (all types), Heater (All Types), Fire Watchman, Lighting Unit (Portable & Generator) Pump, Pump Station(Water, Sewer, Portable, Temporary), Welding Machine (Steel Erection & Excavation).

GROUP V: Mechanics Helper, Motorized Roller (walk behind), Stock Attendant, Welder's Helper, Maintenance Engineer Crane(75 ton and over).

Group VI-A: Welder Certified

GROUP VI-B: Utility Man, Warehouse Man.

WAGES: (per hour)

	07/01/2022	03/06/2023	03/04/2024
GROUP I			
Cranes- up to 49 tons	\$ 65.03	\$ 66.23	\$ 67.43
Cranes- 50 tons to 99 tons	67.28	68.53	69.77
Cranes- 100 tons and over	76.77	78.21	79.64
GROUP I-A	56.97	58.01	59.04
GROUP I-B	52.52	53.48	54.41
GROUP II	54.98	55.98	56.97
GROUP III-A	52.97	53.94	54.88
GROUP III-B	50.44	51.35	52.25
GROUP IV-A	52.44	53.40	54.33
GROUP IV-B	44.38	45.17	45.94
GROUP V	47.83	48.69	49.53
Group VI-A	55.93	56.96	57.96
GROUP VI-B			
Utility Man	45.39	46.21	47.00
Warehouse Man	47.57	48.52	49.26

An additional 20% to wage when required to wear protective equipment on hazardous/toxic waste projects.
 Engineers operating cranes with booms 100 feet but less than 149 feet in length will be paid an additional \$2.00 per hour.
 Engineers operating cranes with booms 149 feet or over in length will be paid an additional \$3.00 per hour.
 Loader operators over 5 cubic yard capacity additional .50 per hour.
 Shovel operators over 4 cubic yard capacity additional \$1.00 per hour.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker	\$ 29.87	\$ 30.57	\$ 31.32
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OVERTIME PAY

See (B, E, Q, V) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 8, 15, 25, 26) on HOLIDAY PAGE

Overtime: See (5, 6, 8, 15, 25, 26) on HOLIDAY PAGE

8-137B

Operating Engineer - Heavy&Highway

08/01/2022

JOB DESCRIPTION Operating Engineer - Heavy&Highway

DISTRICT 8

ENTIRE COUNTIES

Putnam, Westchester

PARTIAL COUNTIES

Dutchess: All the counties of Westchester and Putnam and the southern part of Dutchess County defined by the northern boundary line of the City of Poughkeepsie, then due east to Route 115, then north along Route 115 to Bedell Road, then east along Bedell Road to Van Wagner Road, then north along Van Wagner Road to Bower Road, then east along Bower Road to Route 44 and along Route 44 east to Route 343, then along Route 343 east to the northern boundary of Town of Dover Plains and east along the northern boundary of Town of Dover Plains to the border line of the State of Connecticut and bordered on the west by the middle of the Hudson River.

WAGES

GROUP I: Boom Truck, Cherry Picker, Clamshell, Crane, (Crawler, Truck), Dragline, Drill Rig (Casa Grande, Cat, or Similar), Floating Crane (Crane on Barges) under 100 tons, Gin Pole, Hoist Engineer-Concrete (Crane-Derrick-Mine Hoist), Knuckle Boom Crane, Rough Terrain Crane.

GROUP I-A: Auger (Truck or Truck Mounted), Boat Captain, Bulldozer-All Sizes, Central Mix Plant Operator, Chipper (all types), Close Circuit T.V., Combination Loader/Backhoe, Compactor with Blade, Concrete Finishing Machine, Gradall, Grader (Motor Grader), Elevator & Cage (Materials or Passenger), Excavator (and all attachments), Front End Loaders (1 1/2 yards and over), High Lift Lull and similar, Hoist (Single, Double, Triple Drum), Hoist Portable Mobile Unit, Hoist Engineer (Material), Jack and Bore Machine, Log Skidders, Mill Machines, Mucking Machines, Overhead Crane, Paver (concrete), Post Pounder (of any type), Push Cats, Road Reclaimer, Robot Hammer (Brokk or similar), Robotic Equipment (Scope of Engineer Schedule), Ross Carrier and similar, Scrapers (20 yard struck and over), Side Boom, Slip Form Machine, Spreader (Asphalt), Trenching Machines (Telephies-Vermeer Concrete Saw), Tractor Type Demolition Equipment, Vacuum Truck. Vibratory Roller(Riding) or Roller used in mainline paving operations.

GROUP I-B: Asphalt Mobile Conveyor/Transfer Machine, Road Paver (Asphalt).

GROUP II-A: Ballast Regulators, Compactor Self Propelled, Fusion Machine, Rail Anchor Machines, Roller (4 ton and over), Scrapers (20 yard struck and under).

GROUP II-B: Mechanic (Outside) All Types, Shop Mechanic.

GROUP III: Air Tractor Drill, Asphalt Plant, Batch Plant, Boiler (High Pressure), Concrete Breaker (Track or Rubber Tire), Concrete Pump, Concrete Spreader, Excavator Drill, Farm Tractor, Forklift (all types), Gas Tapping (Live), Hydroseeder, Loader (1 1/2 yards and under), Locomotive (all sizes), Machine Pulling Sheeps Foot Roller, Portable Asphalt Plant, Portable Batch Plant, Portable Crusher (Apprentice), Powerhouse Plant, Roller (under 4 ton), Sheer Excavator, Skid Steer/Bobcat, Stone Crusher, Sweeper (with seat), Well Drilling Machine.

GROUP IV: Service Person (Grease Truck), Deckhand.

GROUP IV-B: Conveyor Belt Machine (Truck Mounted), Heater (all types), Lighting Unit (Portable), Maintenance Engineer (For Crane Only), Mechanics Helper, Pump (Fireproofing), Pumps-Pump Station/Water/Sewer/Gypsum/Plaster, etc., Pump Truck (Sewer Jet or Similar), Welders Helper, Welding Machine (Steel Erection), Well Point System.

GROUP V: All Tower Cranes-All Climbing Cranes and all cranes of 100-ton capacity or greater (3900 Manitowac or similar) irrespective of manufacturer and regardless of how the same is rigged, Hoist Engineer (Steel), Engineer-Pile Driver, Jersey Spreader, Pavement Breaker/Post Hole Digger.

WAGES: Per hour:	07/01/2022	03/06/2023	03/04/2024
Group I	\$ 65.97	\$ 67.27	\$ 68.63
Group I-A	58.16	59.26	60.42
Group I-B	61.28	62.46	63.70
Group II-A	55.70	56.74	57.84
Group II-B	57.44	58.52	59.67
Group III	54.72	55.74	56.81
Group IV	49.74	50.63	51.57
Group IV-B	42.71	43.43	44.19
Group V			
Engineer All Tower, Climbing and Cranes of 100 Tons	74.73	76.24	77.82
Hoist Engineer(Steel)	67.67	69.01	70.41
Engineer(Pile Driver)	72.16	73.61	75.13
Jersey Spreader, Pavement Breaker (Air Ram)Post Hole Digger	56.99	58.06	59.19

SHIFT DIFFERENTIAL:

A 15% premium on all hours paid, including overtime hours for 2nd, 3rd shifts on all government mandated off-shift work

Engineers operating cranes with booms 100 feet but less than 149 feet in length will be paid an additional \$2.00 per hour over the rate listed in the Wage Schedule. Engineers operating cranes with booms 149 feet or over in length will be paid an additional \$3.00 per hour over the rate listed in the Wage Schedule. Loader and Excavator Operators: over 5 cubic yards capacity \$0.50 per hour over the rate listed in the Wage Schedule. Shovel Operators: over 4 cubic yards capacity \$1.00 per hour over the rate listed in the Wage Schedule.

Four (4), ten (10) hour days may be worked at straight time during a week, Monday thru Thursday; Friday may be used as a make-up day.

NOTE - In order to use the 4 Day/10 Hour Work schedule Registration for Use of 4 Day/10 Hour Work Schedule, form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker:	\$ 32.60 up to 40 Hours	\$ 33.75 up to 40 hours	\$ 34.85 up to 40 hours
	After 40 hours \$ 23.40* PLUS \$ 1.20 on all hours worked	After 40 hours \$ 24.50* PLUS \$ 1.25 on all hours worked	After 40 hours \$ 25.55* PLUS \$ 1.25 on all hours worked

*This amount is subject to premium

OVERTIME PAY

See (B, E, P, *R, **U) on OVERTIME PAGE

HOLIDAY

Paid:..... See (5, 6, 8, 15, 25, 26) on HOLIDAY PAGE

Overtime..... See (5, 6, 8, 15, 25, 26) on OVERTIME PAGE

* For Holiday codes 8,15,25,26 code R applies
 ** For Holiday Codes 5 & 6 code U applies

Note: If employees are required to work on Easter Sunday they shall be paid at the rate of triple time.

REGISTERED APPRENTICES

(1)year terms at the following rate.

1st term	\$ 29.08	\$ 29.63	\$ 30.21
2nd term	34.90	35.56	36.25
3rd term	40.71	41.48	42.30
4th term	46.53	47.41	48.34
Supplemental Benefits per hour:			
	24.55	25.70	26.85

8-137HH

Operating Engineer - Heavy&Highway

08/01/2022

JOB DESCRIPTION Operating Engineer - Heavy&Highway

DISTRICT 9

ENTIRE COUNTIES

Putnam, Westchester

PARTIAL COUNTIES

Dutchess: South of the North city line of Poughkeepsie

WAGES

Party Chief - One who directs a survey party
 Instrument Man - One who runs the instrument and assists Party Chief
 Rodman - One who holds the rod and in general, assists the Survey Crew
 Categories cover GPS & Underground Surveying

Per Hour: 07/01/2022

Party Chief	\$ 81.72
Instrument Man	61.43
Rodman	52.40

SUPPLEMENTAL BENEFITS

Per Hour: 07/01/2022

All Categories
 Straight Time: \$ 25.25* plus \$7.15

Premium:
 Time & 1/2 \$ 37.88* plus \$7.15

Double Time \$ 50.50* plus \$7.15

Non-Worked Holiday Supplemental Benefits:
 \$ 16.45

OVERTIME PAY

See (B, *E, Q) on OVERTIME PAGE
 * Doubletime paid on all hours in excess of 8 hours on Saturday

HOLIDAY

Paid: See (5, 6, 7, 11, 12) on HOLIDAY PAGE
 Overtime: See (5, 6, 7, 11, 12) on HOLIDAY PAGE

9-15Dh

Operating Engineer - Heavy&Highway - Tunnel

08/01/2022

JOB DESCRIPTION Operating Engineer - Heavy&Highway - Tunnel

DISTRICT 8

ENTIRE COUNTIES

Putnam, Westchester

PARTIAL COUNTIES

Dutchess: All the counties of Westchester and Putnam and the southern part of Dutchess County defined by the northern boundary line of the City of Poughkeepsie, then due east to Route 115, then north along Route 115 to Bedell Road, then east along Bedell Road to Van Wagner Road, then north along Van Wagner Road to Bower Road, then east along Bower Road to Route 44 and along Route 44 east to Route 343, then along Route 343 east to the northern boundary of Town of Dover Plains and east along the northern boundary of Town of Dover Plains to the border line of the State of Connecticut and bordered on the west by the middle of the Hudson River.

WAGES

GROUP I: Boom Truck, Cherry Picker, Clamshell, Crane(Crawler, Truck), Dragline, Drill Rig Casa Grande(Cat or Similar), Floating Crane(Crane on Barge-Under 100 Tons), Hoist Engineer(Concrete/Crane-Derrick-Mine Hoist), Knuckle Boom Crane, Rough Terrain Crane.

GROUP I-A: Auger(Truck or Truck Mounted), Boat Captain, Bull Dozer-all sizes, Central Mix Plant Operator, Chipper-all types, Close Circuit T.V., Combination Loader/Backhoe, Compactor with Blade, Concrete Finishing Machine, Gradall, Grader(Motor Grader), Elevator & Cage(Materials or Passengers), Excavator(and all attachments), Front End Loaders(1 1/2 yards and over), High Lift Lull, Hoist(Single, Double, Triple Drum), Hoist Portable Mobile Unit, Hoist Engineer(Material), Jack and Bore Machine, Log Skidder, Milling Machine, Moveable Concrete Barrier Transfer & Transport Vehicle, Mucking Machines. Overhead Crane, Paver(Concrete), Post Pounder of any type, Push Cats, Road Reclaimer, Robot Hammer(Brokk or similar), Robotic Equipment(Scope of Engineer Schedule), Ross Carrier and similar machines, Scrapers(20 yards struck and over), Side Boom, Slip Form Machine, Spreader(Asphalt), Trenching Machines, Telephies-Vermeer Concrete Saw, Tractor type demolition equipment, Vacuum Truck, Vibratory Roller (Riding) used in mainline paving operations.

GROUP I-B: Asphalt Mobile Conveyor/Transfer Machine, Road Paver(Asphalt).

GROUP II-A: Ballast Regulators, Compactor(Self-propelled), Fusion Machine, Rail Anchor Machines, Roller(4 ton and over), Scrapers(20 yard struck and under).

GROUP II-B: Mechanic(outside)all types, Shop Mechanic.

GROUP III: Air Tractor Drill, Asphalt Plant, Batch Plant, Boiler(High Pressure), Concrete Breaker(Track or Rubber Tire), Concrete Pump, Concrete Spreader, Excavator Drill, Farm Tractor, Forklift(all types of power), Gas Tapping(Live), Hydroseeder, Loader(1 1/2 yards and under), Locomotive(all sizes), Machine Pulling Sheeps Foot Roller, Portable Asphalt Plant, Portable Batch Plant, Portable Crusher(Apprentice), Powerhouse Plant, Roller(under 4 ton), Sheer Excavator, Skidsteer/Bobcat, Stone Crusher, Sweeper(with seat), Well Drilling Machine.

GROUP IV-A: Service Person(Grease Truck), Deckhand.

GROUP IV-B: Conveyor Belt Machine(Truck Mounted), Heater(all types), Lighting Unit(Portable), Maintenance Engineer(for Crane only), Mechanics Helper, Pump(Fireproofing), Pumps-Pump Station/Water/Sewer/Gypsum/Plaster, etc., Pump Truck(Sewer Jet or similar), Welding Machine(Steel Erection), Welders Helper.

GROUP V-A: Engineer(all Tower Cranes, all Climbing Cranes & all Cranes of 100 ton capacity or greater),Hoist Engineer(Steel-Sub Structure), Engineer-Pile Driver, Jersey-Spreader, Pavement breaker, Post Hole Digger

WAGES: (per hour)

	07/01/2022	03/06/2023	03/04/2024
GROUP I	\$ 65.97	\$ 67.27	\$ 68.63
GROUP I-A	58.16	59.26	60.42
GROUP I-B	61.28	62.46	63.70
GROUP II-A	55.70	56.74	57.84
GROUP II-B	57.44	58.52	59.67
GROUP III	54.72	55.74	56.81
GROUP IV-A	49.74	50.63	51.57
GROUP IV-B	42.71	43.43	44.19
GROUP V-A			
Engineer-Cranes	74.73	76.24	77.82
Engineer-Pile Driver	72.16	73.61	75.13
Hoist Engineer	67.67	69.01	70.41
Jersey Spreader/Post Hole Digger	56.99	58.06	59.19

SHIFT DIFFERENTIAL:

A 15% premium on all hours paid, including overtime hours for 2nd, 3rd shifts on all government mandated off-shift work

An additional 20% to wage when required to wear protective equipment on hazardous/toxic waste projects. Operators required to use two buckets pouring concrete on other than road pavement shall receive \$0.50 per hour over scale. Engineers operating cranes with booms 100 feet but less than 149 feet in length will be paid an additional \$2.00 per hour. Engineers operating cranes with booms 149 feet or over in length will be paid an additional \$3.00 per hour. Operators of shovels with a capacity over (4) cubic yards shall be paid an additional \$1.00 per hour. Operators of loaders with a capacity over (5) cubic yards shall be paid an additional \$0.50 per hour.

SUPPLEMENTAL BENEFITS

Per hour:
 Journeyworker:

\$ 32.60 up to 40 hours After 40 hours \$23.40 plus \$1.20 on all hours worked	\$ 33.75 up to 40 hours After 40 hours \$24.50 plus \$1.25 on all hours worked	\$ 34.85 up to 40 hours After 40 hours \$25.55 plus \$1.25 on all hours worked
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OVERTIME PAY

See (D, O, *U, V) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 8, 15, 25, 26) on HOLIDAY PAGE
 Overtime: See (5, 6, 8, 15, 25, 26) on HOLIDAY PAGE

* Note: For Holiday codes 5 & 6, code U applies. For Holiday codes 8, 15, 25, 26, code R applies.
 Note: If employees are required to work on Easter Sunday, they shall be paid at the rate of triple time.

REGISTERED APPRENTICES

(1)year terms at the following rates:

1st term	\$ 29.08	\$ 29.63	\$ 30.21
2nd term	34.90	35.56	36.25
3rd term	40.71	41.48	42.30
4th term	46.53	47.41	48.34

Supplemental Benefits per hour:

All terms	\$ 24.55	\$ 25.70	\$ 26.85
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8-137Tun

Operating Engineer - Marine Dredging

08/01/2022

JOB DESCRIPTION Operating Engineer - Marine Dredging

DISTRICT 4

ENTIRE COUNTIES

Albany, Bronx, Cayuga, Clinton, Columbia, Dutchess, Essex, Franklin, Greene, Jefferson, Kings, Monroe, Nassau, New York, Orange, Oswego, Putnam, Queens, Rensselaer, Richmond, Rockland, St. Lawrence, Suffolk, Ulster, Washington, Wayne, Westchester

WAGES

These wages do not apply to Operating Engineers on land based construction projects. For those projects, please see the Operating Engineer Heavy/Highway Rates. The wage rates below for all equipment and operators are only for marine dredging work in navigable waters found in the counties listed above.

Per Hour:	07/01/2022	10/01/2022
CLASS A1 Deck Captain, Leverman Mechanical Dredge Operator Licensed Tug Operator 1000HP or more.	\$ 42.66	\$ 43.94
CLASS A2 Crane Operator (360 swing)	38.02	39.16
CLASS B Dozer, Front Loader Operator on Land	To conform to Operating Engineer Prevailing Wage in locality where work is being performed including benefits.	
CLASS B1 Derrick Operator (180 swing) Spider/Spill Barge Operator Operator II, Fill Placer, Engineer, Chief Mate, Electrician, Chief Welder, Maintenance Engineer Licensed Boat, Crew Boat Operator	36.89	38.00
CLASS B2 Certified Welder	34.73	35.77

CLASS C1 Drag Barge Operator, Steward, Mate, Assistant Fill Placer	33.78	34.79
CLASS C2 Boat Operator	32.69	33.67
CLASS D Shoreman, Deckhand, Oiler, Rodman, Scowman, Cook, Messman, Porter/Janitor	27.16	27.97

SUPPLEMENTAL BENEFITS

Per Hour:

THE FOLLOWING SUPPLEMENTAL BENEFITS APPLY TO ALL CATEGORIES

All Classes A & B	\$ 11.40 plus 6% of straight time wage, Overtime hours add \$ 0.63	\$ 11.85 plus 6% of straight time wage, Overtime hours add \$ 0.63
All Class C	\$ 11.10 plus 6% of straight time wage, Overtime hours add \$ 0.48	\$ 11.60 plus 6% of straight time wage, Overtime hours add \$ 0.50
All Class D	\$ 10.80 plus 6% of straight time wage, Overtime hours add \$ 0.33	\$ 11.35 plus 6% of straight time wage, Overtime hours add \$ 0.38

OVERTIME PAY

See (B2, F, R) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 8, 15, 26) on HOLIDAY PAGE

4-25a-MarDredge

Operating Engineer - Survey Crew - Consulting Engineer 08/01/2022

JOB DESCRIPTION Operating Engineer - Survey Crew - Consulting Engineer **DISTRICT 9**

ENTIRE COUNTIES
 Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Suffolk, Westchester

PARTIAL COUNTIES
 Dutchess: That part in Dutchess County lying South of the North City line of Poughkeepsie.

WAGES
 Feasibility and preliminary design surveying, any line and grade surveying for inspection or supervision of construction.

Per hour: 07/01/2022
 Survey Classifications

Party Chief	\$ 46.44
Instrument Man	38.60
Rodman	33.64

SUPPLEMENTAL BENEFITS

Per Hour:

All Crew Members: \$ 21.60

OVERTIME PAY

OVERTIME:.... See (B, E*, Q, V) ON OVERTIME PAGE.
 *Doubletime paid on the 9th hour on Saturday.

HOLIDAY

Paid: See (5, 6, 7, 11, 16) on HOLIDAY PAGE

Overtime: See (5, 6, 7, 11, 16) on HOLIDAY PAGE

9-15dconsult

Painter **08/01/2022**

JOB DESCRIPTION Painter **DISTRICT 8**

ENTIRE COUNTIES
 Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour:	07/01/2022
Brush	\$ 51.45*
Abatement/Removal of lead based or lead containing paint on materials to be repainted.	51.45*
Spray & Scaffold	\$ 54.45*
Fire Escape	54.45*
Decorator	54.45*
Paperhanger/Wall Coverer	53.83*

*Subtract \$ 0.10 to calculate premium rate.

SUPPLEMENTAL BENEFITS

Per hour:

Paperhanger	\$ 33.15
All others	30.88
Premium	37.72**

**Applies only to "All others" category, not paperhanger journeyworker.

OVERTIME PAY

See (A, H) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

One (1) year terms at the following wage rate.

Per hour:	07/01/2022
Appr 1st term...	\$ 19.95*
Appr 2nd term...	25.56*
Appr 3rd term...	31.00*
Appr 4th term...	41.52*

*Subtract \$ 0.10 to calculate premium rate.

Supplemental benefits:

Per Hour:

Appr 1st term...	\$ 15.22
Appr 2nd term...	18.90
Appr 3rd term...	21.81
Appr 4th term...	27.58

8-NYDC9-B/S

Painter **08/01/2022**

JOB DESCRIPTION Painter **DISTRICT 8**

ENTIRE COUNTIES
 Putnam, Suffolk, Westchester

PARTIAL COUNTIES

Nassau: All of Nassau except the areas described below: Atlantic Beach, Ceaderhurst, East Rockaway, Gibson, Hewlett, Hewlett Bay, Hewlett Neck, Hewlett Park, Inwood, Lawrence, Lido Beach, Long Beach, parts of Lynbrook, parts of Oceanside, parts of Valley Stream, and Woodmere. Starting on the South side of Sunrise Hwy in Valley Stream running east to Windsor and Rockaway Ave., Rockville Centre is the boundary line up to Lawson Blvd. turn right going west all the above territory. Starting at Union Turnpike and Lakeville Rd. going north to Northern Blvd. the west side of Lakeville road to Northern blvd. At Northern blvd. going east the district north of Northern blvd. to Port Washington Blvd. West of Port Washington blvd. to St. Francis Hospital then north of first traffic light to Port Washington and Sands Point, Manor HAven, Harbour Acres.

WAGES

Per hour: 07/01/2022
 Drywall Taper \$ 51.45*

*Subtract \$ 0.10 to calculate premium rate.

SUPPLEMENTAL BENEFITS

Per hour:
 Journeyman \$ 30.88

OVERTIME PAY

See (A, H) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wages - Per Hour:

1500 hour terms at the following wage rate:

1st term \$ 19.95*
 2nd term 25.56*
 3rd term 31.00*
 4th term 41.52*

*Subtract \$ 0.10 to calculate premium rate.

Supplemental Benefits - Per hour:

One year term (1500 hours) at the following dollar amount.

1st year \$ 15.22
 2nd year 18.90
 3rd year 21.81
 4th year 27.58

8-NYDCT9-DWT

Painter - Bridge & Structural Steel

08/01/2022

JOB DESCRIPTION Painter - Bridge & Structural Steel

DISTRICT 8

ENTIRE COUNTIES

Albany, Bronx, Clinton, Columbia, Dutchess, Essex, Franklin, Fulton, Greene, Hamilton, Kings, Montgomery, Nassau, New York, Orange, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Suffolk, Sullivan, Ulster, Warren, Washington, Westchester

WAGES

Per Hour:

STEEL:
 Bridge Painting: 07/01/2022 10/01/2022
 \$ 53.00 Additional
 + 9.63* \$ 3.00

ADDITIONAL \$6.00 per hour for POWER TOOL/SPRAY, whether straight time or overtime.

NOTE: All premium wages are to be calculated on base rate per hour only.

* For the period of May 1st to November 15th, this amount is payable up to 40 hours. For the period of Nov 16th to April 30th, this amount is payable up to 50 hours. EXCEPTION: First and last week of employment, and for the weeks of Memorial Day, Independence Day and Labor Day, where the amount is paid for the actual number of hours worked (no cap).

NOTE: Generally, for Bridge Painting Contracts, ALL WORKERS on and off the bridge (including Flagmen) are to be paid Painter's Rate; the contract must be ONLY for Bridge Painting.

SHIFT WORK:

When directly specified in public agency or authority contract documents for an employer to work a second shift and works the second shift with employees other than from the first shift, all employees who work the second shift will be paid 10% of the base wage shift differential in lieu of overtime for the first eight (8) hours worked after which the employees shall be paid at time and one half of the regular wage rate. When a single irregular work shift is mandated in the job specifications or by the contracting agency, wages shall be paid at time and one half for single shifts between the hours of 3pm-11pm or 11pm-7am.

SUPPLEMENTAL BENEFITS

Per Hour:

Journeyworker:

\$ 10.90
 + 30.60*

* For the period of May 1st to November 15th, this amount is payable up to 40 hours. For the period of Nov 16th to April 30th, this amount is payable up to 50 hours. EXCEPTION: First and last week of employment, and for the weeks of Memorial Day, Independence Day and Labor Day, where the amount is paid for the actual number of hours worked (no cap).

OVERTIME PAY

See (B, F, R) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (4, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wage - Per hour:

Apprentices: (1) year terms

1st year \$ 21.20
 + 3.86

2nd year \$ 31.80
 + 5.78

3rd year \$ 42.40
 + 7.70

Supplemental Benefits - Per hour:

1st year \$.25
 + 12.24

2nd year \$ 10.90
 + 18.36

3rd year \$ 10.90
 + 24.48

NOTE: All premium wages are to be calculated on base rate per hour only.

8-DC-9/806/155-BrSS

Painter - Line Striping

08/01/2022

JOB DESCRIPTION Painter - Line Striping

DISTRICT 8

ENTIRE COUNTIES

Albany, Clinton, Columbia, Dutchess, Essex, Franklin, Fulton, Greene, Hamilton, Montgomery, Nassau, Orange, Putnam, Rensselaer, Rockland, Saratoga, Schenectady, Schoharie, Suffolk, Sullivan, Ulster, Warren, Washington, Westchester

WAGES

Per hour:

Painter (Striping-Highway): 07/01/2022
 Striping-Machine Operator* \$ 31.53

Linerman Thermoplastic 38.34

Note: * Includes but is not limited to: Positioning of cones and directing of traffic using hand held devices. Excludes the Driver/Operator of equipment used in the maintenance and protection of traffic safety.

Four (4), ten (10) hour days may be worked at straight time during a week, Monday thru Thursday. Friday may be used as a make-up day.

NOTE - In order to use the '4 Day/10 Hour Work Schedule,' as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule,' form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

SUPPLEMENTAL BENEFITS

Per hour paid:

Journeyworker:	
Striping Machine Operator:	\$ 10.03
Linerman Thermoplastic:	10.03

OVERTIME PAY

See (B, B2, E2, F, S) on OVERTIME PAGE

HOLIDAY

Paid:	See (5, 20) on HOLIDAY PAGE
Overtime:	See (5, 20) on HOLIDAY PAGE

REGISTERED APPRENTICES

One (1) year terms at the following wage rates:

1st Term:	\$ 15.00
2nd Term:	18.92
3rd Term:	25.22

Supplemental Benefits per hour:

1st term:	\$ 9.16
2nd Term:	10.03
3rd Term:	10.03

8-1456-LS

Painter - Metal Polisher

08/01/2022

JOB DESCRIPTION Painter - Metal Polisher

DISTRICT 8

ENTIRE COUNTIES

Albany, Allegany, Bronx, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Kings, Lewis, Livingston, Madison, Monroe, Montgomery, Nassau, New York, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Suffolk, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES

	07/01/2022
Metal Polisher	\$ 37.78
Metal Polisher*	38.80
Metal Polisher**	41.78

*Note: Applies on New Construction & complete renovation

** Note: Applies when working on scaffolds over 34 feet.

SUPPLEMENTAL BENEFITS

Per Hour: 07/01/2022

Journeyworker:	
All classification	\$ 11.24

OVERTIME PAY

See (B, E, P, T) on OVERTIME PAGE

HOLIDAY

Paid:	See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE
Overtime:	See (5, 6, 9, 11, 15, 16, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wages per hour:

One (1) year term at the following wage rates:

	07/01/2022
1st year	\$ 16.00
2nd year	17.00
3rd year	18.00
1st year*	\$ 16.39

2nd year*	17.44
3rd year*	18.54
1st year**	\$ 18.50
2nd year**	19.50
3rd year**	20.50

*Note: Applies on New Construction & complete renovation
 ** Note: Applies when working on scaffolds over 34 feet.

Supplemental benefits:
 Per hour:

1st year	\$ 7.99
2nd year	7.99
3rd year	7.99

8-8A/28A-MP

Plumber

08/01/2022

JOB DESCRIPTION Plumber

DISTRICT 8

ENTIRE COUNTIES
 Putnam, Westchester

WAGES

Per hour:

07/01/2022

Plumber and Steamfitter	\$ 60.21
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SHIFT WORK:

When directly specified in public agency or authority contract documents, shift work outside the regular hours of work shall be comprised of eight (8) hours per shift not including Saturday, Sundays and holidays. One half (1/2) hour shall be allowed for lunch after the first four (4) hours of each shift. Wage and Fringes for shift work shall be straight time plus a shift premium of twenty-five (25%) percent. A minimum of five days Monday through Friday must be worked to establish shift work.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker	\$ 40.01
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OVERTIME PAY

See (B, E, E2, Q, V) on OVERTIME PAGE
 OVERTIME:... See on OVERTIME PAGE.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 8, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

(1)year terms at the following wages:

1st Term	\$ 22.36
2nd Term	25.66
3rd Term	29.63
4th Term	42.28
5th Term	45.36

Supplemental Benefits per hour:

1st term	\$ 16.54
2nd term	18.46
3rd term	21.96
4th term	28.95
5th term	30.68

8-21.1-ST

Plumber - HVAC / Service

08/01/2022

JOB DESCRIPTION Plumber - HVAC / Service

DISTRICT 8

ENTIRE COUNTIES

Dutchess, Putnam, Westchester

PARTIAL COUNTIES

Delaware: Only the townships of Middletown and Roxbury

Ulster: Entire County(including Wallkill and Shawangunk Prisons) except for remainder of Town of Shawangunk and Towns of Plattekill, Marlboro, and Wawarsing.

WAGES

Per hour: 07/01/2022

HVAC Service \$ 41.68
+ \$ 4.32*

*Note: This portion of wage is not subject to overtime premium.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker HVAC Service
\$ 27.79

OVERTIME PAY

See (B, F, R) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 16, 25) on HOLIDAY PAGE

Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

HVAC SERVICE

(1)year terms at the following wages:

1st yr.	2nd yr.	3rd yr.	4th yr.	5th yr.
\$ 18.87	\$ 22.36	\$ 27.91	\$ 34.33	\$ 37.25
+\$2.37*	+\$2.67*	+\$3.22*	+\$3.84*	+\$4.07*

*Note: This portion of wage is not subject to overtime premium.

Supplemental Benefits per hour:

Apprentices 07/01/2022

1st term \$ 20.30
2nd term 21.62
3rd term 23.07
4th term 25.05
5th term 26.47

8-21.1&2-SF/Re/AC

Plumber - Jobbing & Alterations

08/01/2022

JOB DESCRIPTION Plumber - Jobbing & Alterations

DISTRICT 8

ENTIRE COUNTIES

Dutchess, Putnam, Westchester

PARTIAL COUNTIES

Ulster: Entire county (including Wallkill and Shawangunk Prisons in Town of Shawangunk) EXCEPT for remainder of Town of Shawangunk, and Towns of Plattekill, Marlboro, and Wawarsing.

WAGES

Per hour: 07/01/2022

Journeyworker: \$ 46.79

Repairs, replacements and alteration work is any repair or replacement of a present plumbing system that does not change existing roughing or water supply lines.

SHIFT WORK:

When directly specified in public agency or authority contract documents, shift work outside the regular hours of work shall be comprised of eight (8) hours per shift not including Saturday, Sundays and holidays. One half (1/2) hour shall be allowed for lunch after the first four (4) hours of each shift. Wage and Fringes for shift work shall be straight time plus a shift premium of twenty-five (25%) percent. A minimum of five days Monday through Friday must be worked to establish shift work.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker \$ 33.56

OVERTIME PAY

See (B, *E, E2, Q, V) on OVERTIME PAGE

*When used as a make-up day, hours after 8 on Saturday shall be paid at time and one half.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 8, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

(1) year terms at the following wages:

1st year	\$ 20.25
2nd year	22.48
3rd year	24.40
4th year	34.25
5th year	36.19

Supplemental Benefits per hour:

1st year	\$ 10.98
2nd year	12.92
3rd year	16.89
4th year	22.82
5th year	24.77

8-21.3-J&A

Roofer **08/01/2022**

JOB DESCRIPTION Roofer

DISTRICT 9

ENTIRE COUNTIES

Bronx, Dutchess, Kings, New York, Orange, Putnam, Queens, Richmond, Rockland, Sullivan, Ulster, Westchester

WAGES

Per Hour:	07/01/2022	05/01/2023
		Additional
Roofer/Waterproofer	\$ 45.25	\$ 2.00
	+ \$7.00*	

* This portion is not subjected to overtime premiums.

Note: Abatement/Removal of Asbestos containing roofs and roofing material is classified as Roofer.

SUPPLEMENTAL BENEFITS

Per Hour: \$ 30.62

OVERTIME PAY

See (B, H) on OVERTIME PAGE

Note: An observed holiday that falls on a Sunday will be observed the following Monday.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES

(1) year term

	1st	2nd	3rd	4th
	\$ 15.84	\$ 22.63	\$ 27.15	\$ 33.94
		+ 3.50*	+ 4.20*	+ 5.26*

Supplements:

	1st	2nd	3rd	4th
	\$ 3.88	\$ 15.48	\$ 18.50	\$ 23.04

* This portion is not subjected to overtime premiums.

Sheetmetal Worker **08/01/2022**

JOB DESCRIPTION Sheetmetal Worker **DISTRICT 8**

ENTIRE COUNTIES
 Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, Westchester

WAGES

SheetMetal Worker 07/01/2022
\$ 45.25
+ 3.52*

*This portion is not subject to overtime premiums.

SHIFT WORK

For all NYS D.O.T. and other Governmental mandated off-shift work:
 10% increase for additional shifts for a minimum of five (5) days

SUPPLEMENTAL BENEFITS

Journeyworker \$ 45.20

OVERTIME PAY

OVERTIME:.. See (B, E, Q,) on OVERTIME PAGE.

HOLIDAY

Paid: See (1) on HOLIDAY PAGE
 Overtime: See (5, 6, 8, 15, 16, 23) on HOLIDAY PAGE

REGISTERED APPRENTICES

1st	2nd	3rd	4th	5th	6th	7th	8th
\$ 16.79	\$ 18.88	\$ 21.00	\$ 23.08	\$ 25.20	\$ 27.30	\$ 29.89	\$ 32.43
+ 1.41*	+ 1.58*	+ 1.76*	+ 1.94*	+ 2.11*	+ 2.29*	+ 2.46*	+ 2.64*

*This portion is not subject to overtime premiums.

Supplemental Benefits per hour:

Apprentices

1st term	\$ 19.37
2nd term	21.81
3rd term	24.21
4th term	26.65
5th term	29.06
6th term	31.48
7th term	33.42
8th term	35.40

Sheetmetal Worker **08/01/2022**

JOB DESCRIPTION Sheetmetal Worker **DISTRICT 4**

ENTIRE COUNTIES
 Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES

Per Hour: 07/01/2022

Sign Erector \$ 53.79

NOTE: Structurally Supported Overhead Highway Signs(See STRUCTURAL IRON WORKER CLASS)

SUPPLEMENTAL BENEFITS

Per Hour: 07/01/2022

Sign Erector \$ 53.33

OVERTIME PAY

See (A, F, S) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 10, 11, 12, 16, 25) on HOLIDAY PAGE
 Overtime: See (5, 6, 10, 11, 12, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

Per Hour:
 6 month Terms at the following percentage of Sign Erectors wage rate:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
35%	40%	45%	50%	55%	60%	65%	70%	75%	80%

SUPPLEMENTAL BENEFITS

Per Hour:

07/01/2022

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$ 14.34	\$ 16.26	\$ 18.17	\$ 20.10	\$ 28.02	\$ 30.47	\$ 33.72	\$ 36.27	\$ 38.77	\$ 41.29

4-137-SE

Sprinkler Fitter

08/01/2022

JOB DESCRIPTION Sprinkler Fitter

DISTRICT 1

ENTIRE COUNTIES

Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, Westchester

WAGES

Per hour 07/01/2022

Sprinkler Fitter \$ 48.98

SUPPLEMENTAL BENEFITS

Per hour

Journeyman \$ 29.13

OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE

HOLIDAY

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6) on HOLIDAY PAGE

Note: When a holiday falls on Sunday, the following Monday shall be considered a holiday and all work performed on either day shall be at the double time rate. When a holiday falls on Saturday, the preceding Friday shall be considered a holiday and all work performed on either day shall be at the double time rate.

REGISTERED APPRENTICES

Wages per hour

One Half Year terms at the following wage.

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$ 23.70	\$ 26.34	\$ 28.72	\$ 31.35	\$ 33.99	\$ 36.62	\$ 39.25	\$ 41.89	\$ 44.52	\$ 47.15

Supplemental Benefits per hour

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$ 8.37	\$ 8.37	\$ 19.76	\$ 19.76	\$ 20.01	\$ 20.01	\$ 20.01	\$ 20.01	\$ 20.01	\$ 20.01

1-669.2

Teamster - Building / Heavy&Highway

08/01/2022

JOB DESCRIPTION Teamster - Building / Heavy&Highway

DISTRICT 8

ENTIRE COUNTIES

Putnam, Westchester

WAGES

GROUP A: Straight Trucks (6-wheeler and 10-wheeler), A-frame, Winch, Dynamite Seeding, Mulching, Agitator, Water, Attenuator, Light Towers, Cement (all types), Suburban, Station Wagons, Cars, Pick Ups, any vehicle carrying materials of any kind.

GROUP AA: Tack Coat

GROUP B: Tractor & Trailers (all types).

GROUP BB: Tri-Axle, 14 Wheeler

GROUP C: Low Boy (carrying equipment).

GROUP D: Fuel Trucks, Tire Trucks.

GROUP E: Off-road Equipment (over 40 tons): Athey Wagons, Belly Dumps, Articulated Dumps, Trailer Wagons.
 GROUP F: Off-road Equipment (over 40 tons) Euclid, DJB.
 GROUP G: Off-road Equipment (under 40 tons) Athey Wagons, Belly Articulated Dumps, Trailer Wagons.
 GROUP H: Off-road Equipment(under 40 tons), Euclid.
 GROUP HH: Off-road Equipment(under 40 tons) D.J.B.
 GROUP I: Off-road Equipment(under 40 tons) Darts.
 GROUP II: Off-road Equipment(under 40 tons) RXS.

WAGES:(per hour)

07/01/2022

GROUP A	\$ 46.07*
GROUP AA	49.07*
GROUP B	46.69*
GROUP BB	46.19*
GROUP C	48.82*
GROUP D	46.52*
GROUP E	47.07*
GROUP F	48.07*
GROUP G	46.82*
GROUP H	47.44*
GROUP HH	47.82*
GROUP I	47.57*
GROUP II	47.94*

* To calculate premium wage, subtract \$.20 from the hourly wage.

Note: Fuel truck operators on construction sites addit. \$5.00 per day.
 For work on hazardous/toxic waste site addit. 20% of hourly rate.

Shift Differential: When mandated by the contracting agency, DOT, or any governmental agency contracts shall receive a shift differential of fifteen (15%) above the wage rate.

Four (4), ten (10) hour days may be worked at straight time during a week, Monday thru Thursday.

NOTE - In order to use the '4 Day/10 Hour Work schedule', as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule,' form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker

First 40 hours	\$ 33.87
41st-45th hours	14.88
Over 45 hours	0.75

OVERTIME PAY

See (B, E, P, R) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 6, 8, 9, 15, 25) on HOLIDAY PAGE
 Overtime: See (5, 6, 8, 9, 15, 25) on HOLIDAY PAGE

8-456

Welder

08/01/2022

JOB DESCRIPTION Welder

DISTRICT 1

ENTIRE COUNTIES

Albany, Allegany, Bronx, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Kings, Lewis, Livingston, Madison, Monroe, Montgomery, Nassau, New York, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Suffolk, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES

Per hour 07/01/2022

Welder: To be paid the same rate of the mechanic performing the work.*

*EXCEPTION: If a specific welder certification is required, then the 'Certified Welder' rate in that trade tag will be paid.

OVERTIME PAY
HOLIDAY

1-As Per Trade

Overtime Codes

Following is an explanation of the code(s) listed in the OVERTIME section of each classification contained in the attached schedule. Additional requirements may also be listed in the HOLIDAY section.

NOTE: Supplemental Benefits are 'Per hour worked' (for each hour worked) unless otherwise noted

- (AA) Time and one half of the hourly rate after 7 and one half hours per day
- (A) Time and one half of the hourly rate after 7 hours per day
- (B) Time and one half of the hourly rate after 8 hours per day
- (B1) Time and one half of the hourly rate for the 9th & 10th hours week days and the 1st 8 hours on Saturday.
Double the hourly rate for all additional hours
- (B2) Time and one half of the hourly rate after 40 hours per week
- (C) Double the hourly rate after 7 hours per day
- (C1) Double the hourly rate after 7 and one half hours per day
- (D) Double the hourly rate after 8 hours per day
- (D1) Double the hourly rate after 9 hours per day
- (E) Time and one half of the hourly rate on Saturday
- (E1) Time and one half 1st 4 hours on Saturday; Double the hourly rate all additional Saturday hours
- (E2) Saturday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather
- (E3) Between November 1st and March 3rd Saturday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather, provided a given employee has worked between 16 and 32 hours that week
- (E4) Saturday and Sunday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather
- (E5) Double time after 8 hours on Saturdays
- (F) Time and one half of the hourly rate on Saturday and Sunday
- (G) Time and one half of the hourly rate on Saturday and Holidays
- (H) Time and one half of the hourly rate on Saturday, Sunday, and Holidays
- (I) Time and one half of the hourly rate on Sunday
- (J) Time and one half of the hourly rate on Sunday and Holidays
- (K) Time and one half of the hourly rate on Holidays
- (L) Double the hourly rate on Saturday
- (M) Double the hourly rate on Saturday and Sunday
- (N) Double the hourly rate on Saturday and Holidays
- (O) Double the hourly rate on Saturday, Sunday, and Holidays
- (P) Double the hourly rate on Sunday
- (Q) Double the hourly rate on Sunday and Holidays
- (R) Double the hourly rate on Holidays
- (S) Two and one half times the hourly rate for Holidays

- (S1) Two and one half times the hourly rate the first 8 hours on Sunday or Holidays One and one half times the hourly rate all additional hours.
- (T) Triple the hourly rate for Holidays
- (U) Four times the hourly rate for Holidays
- (V) Including benefits at SAME PREMIUM as shown for overtime
- (W) Time and one half for benefits on all overtime hours.
- (X) Benefits payable on Paid Holiday at straight time. If worked, additional benefit amount will be required for worked hours. (Refer to other codes listed.)

Holiday Codes

PAID Holidays:

Paid Holidays are days for which an eligible employee receives a regular day's pay, but is not required to perform work. If an employee works on a day listed as a paid holiday, this remuneration is in addition to payment of the required prevailing rate for the work actually performed.

OVERTIME Holiday Pay:

Overtime holiday pay is the premium pay that is required for work performed on specified holidays. It is only required where the employee actually performs work on such holidays. The applicable holidays are listed under HOLIDAYS: OVERTIME. The required rate of pay for these covered holidays can be found in the OVERTIME PAY section listings for each classification.

Following is an explanation of the code(s) listed in the HOLIDAY section of each classification contained in the attached schedule. The Holidays as listed below are to be paid at the wage rates at which the employee is normally classified.

- (1) None
- (2) Labor Day
- (3) Memorial Day and Labor Day
- (4) Memorial Day and July 4th
- (5) Memorial Day, July 4th, and Labor Day
- (6) New Year's, Thanksgiving, and Christmas
- (7) Lincoln's Birthday, Washington's Birthday, and Veterans Day
- (8) Good Friday
- (9) Lincoln's Birthday
- (10) Washington's Birthday
- (11) Columbus Day
- (12) Election Day
- (13) Presidential Election Day
- (14) 1/2 Day on Presidential Election Day
- (15) Veterans Day
- (16) Day after Thanksgiving
- (17) July 4th
- (18) 1/2 Day before Christmas
- (19) 1/2 Day before New Years
- (20) Thanksgiving
- (21) New Year's Day
- (22) Christmas
- (23) Day before Christmas
- (24) Day before New Year's
- (25) Presidents' Day
- (26) Martin Luther King, Jr. Day
- (27) Memorial Day
- (28) Easter Sunday

(29) Juneteenth



New York State Department of Labor - Bureau of Public Work
 State Office Building Campus
 Building 12 - Room 130
 Albany, New York 12240

REQUEST FOR WAGE AND SUPPLEMENT INFORMATION

As Required by Articles 8 and 9 of the NYS Labor Law

Fax (518) 485-1870 or mail this form for new schedules or for determination for additional occupations.

This Form Must Be Typed

Submitted By: Contracting Agency Architect or Engineering Firm Public Work District Office Date:

(Check Only One)

A. Public Work Contract to be let by: (Enter Data Pertaining to Contracting/Public Agency)

<p>1. Name and complete address <input type="checkbox"/> (Check if new or change)</p> <p>Telephone: () Fax: ()</p> <p>E-Mail:</p>	<p>2. NY State Units (see Item 5)</p> <table style="width:100%; border: none;"> <tr> <td style="width:50%; border: none;"> <input type="checkbox"/> 01 DOT <input type="checkbox"/> 02 OGS <input type="checkbox"/> 03 Dormitory Authority <input type="checkbox"/> 04 State University Construction Fund <input type="checkbox"/> 05 Mental Hygiene Facilities Corp. <input type="checkbox"/> 06 OTHER N.Y. STATE UNIT </td> <td style="width:50%; border: none;"> <input type="checkbox"/> 07 City <input type="checkbox"/> 08 Local School District <input type="checkbox"/> 09 Special Local District, i.e., Fire, Sewer, Water District <input type="checkbox"/> 10 Village <input type="checkbox"/> 11 Town <input type="checkbox"/> 12 County <input type="checkbox"/> 13 Other Non-N.Y. State (Describe) </td> </tr> </table>	<input type="checkbox"/> 01 DOT <input type="checkbox"/> 02 OGS <input type="checkbox"/> 03 Dormitory Authority <input type="checkbox"/> 04 State University Construction Fund <input type="checkbox"/> 05 Mental Hygiene Facilities Corp. <input type="checkbox"/> 06 OTHER N.Y. STATE UNIT	<input type="checkbox"/> 07 City <input type="checkbox"/> 08 Local School District <input type="checkbox"/> 09 Special Local District, i.e., Fire, Sewer, Water District <input type="checkbox"/> 10 Village <input type="checkbox"/> 11 Town <input type="checkbox"/> 12 County <input type="checkbox"/> 13 Other Non-N.Y. State (Describe)
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<p>3. SEND REPLY TO <input type="checkbox"/> check if new or change) Name and complete address:</p> <p>Telephone:() Fax: ()</p> <p>E-Mail:</p>	<p>4. SERVICE REQUIRED. Check appropriate box and provide project information.</p> <p><input type="checkbox"/> New Schedule of Wages and Supplements. <input style="width:100%; border: 1px solid black;" type="text"/> APPROXIMATE BID DATE : <input type="checkbox"/> Additional Occupation and/or Redetermination</p> <table style="width:100%; border: none; margin-top: 10px;"> <tr> <td style="width:50%; border: 1px solid black; padding: 5px;"> PRC NUMBER ISSUED PREVIOUSLY FOR THIS PROJECT : </td> <td style="width:50%; border: 1px solid black; padding: 5px;"> OFFICE USE ONLY </td> </tr> </table>	PRC NUMBER ISSUED PREVIOUSLY FOR THIS PROJECT :	OFFICE USE ONLY
PRC NUMBER ISSUED PREVIOUSLY FOR THIS PROJECT :	OFFICE USE ONLY		

B. PROJECT PARTICULARS

<p>5. Project Title _____</p> <p>Description of Work _____</p> <p>_____</p> <p>Contract Identification Number _____</p> <p>Note: For NYS units, the OSC Contract No. _____</p>	<p>6. Location of Project: Location on Site _____</p> <p>Route No/Street Address _____</p> <p>Village or City _____</p> <p>Town _____</p> <p>County _____</p>
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<p>7. Nature of Project - Check One:</p> <p><input type="checkbox"/> 1. New Building</p> <p><input type="checkbox"/> 2. Addition to Existing Structure</p> <p><input type="checkbox"/> 3. Heavy and Highway Construction (New and Repair)</p> <p><input type="checkbox"/> 4. New Sewer or Waterline</p> <p><input type="checkbox"/> 5. Other New Construction (Explain)</p> <p><input type="checkbox"/> 6. Other Reconstruction, Maintenance, Repair or Alteration</p> <p><input type="checkbox"/> 7. Demolition</p> <p><input type="checkbox"/> 8. Building Service Contract</p>	<p>8. OCCUPATION FOR PROJECT :</p> <table style="width:100%; border: none;"> <tr> <td style="width:50%; border: none;"> <input type="checkbox"/> Construction (Building, Heavy Highway/Sewer/Water) <input type="checkbox"/> Tunnel <input type="checkbox"/> Residential <input type="checkbox"/> Landscape Maintenance <input type="checkbox"/> Elevator maintenance <input type="checkbox"/> Exterminators, Fumigators <input type="checkbox"/> Fire Safety Director, NYC Only </td> <td style="width:50%; border: none;"> <input type="checkbox"/> Guards, Watchmen <input type="checkbox"/> Janitors, Porters, Cleaners, Elevator Operators <input type="checkbox"/> Moving furniture and equipment <input type="checkbox"/> Trash and refuse removal <input type="checkbox"/> Window cleaners <input type="checkbox"/> Other (Describe) </td> </tr> </table>	<input type="checkbox"/> Construction (Building, Heavy Highway/Sewer/Water) <input type="checkbox"/> Tunnel <input type="checkbox"/> Residential <input type="checkbox"/> Landscape Maintenance <input type="checkbox"/> Elevator maintenance <input type="checkbox"/> Exterminators, Fumigators <input type="checkbox"/> Fire Safety Director, NYC Only	<input type="checkbox"/> Guards, Watchmen <input type="checkbox"/> Janitors, Porters, Cleaners, Elevator Operators <input type="checkbox"/> Moving furniture and equipment <input type="checkbox"/> Trash and refuse removal <input type="checkbox"/> Window cleaners <input type="checkbox"/> Other (Describe)
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9. Has this project been reviewed for compliance with the Wicks Law involving separate bidding? YES NO

10. Name and Title of Requester	Signature
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NEW YORK STATE DEPARTMENT OF LABOR
Bureau of Public Work - Debarment List

**LIST OF EMPLOYERS INELIGIBLE TO BID ON OR BE
AWARDED ANY PUBLIC WORK CONTRACT**

Under Article 8 and Article 9 of the NYS Labor Law, a contractor, sub-contractor and/or its successor shall be debarred and ineligible to submit a bid on or be awarded any public work or public building service contract/sub-contract with the state, any municipal corporation or public body for a period of five (5) years from the date of debarment when:

- Two (2) final determinations have been rendered within any consecutive six-year (6) period determining that such contractor, sub-contractor and/or its successor has WILLFULLY failed to pay the prevailing wage and/or supplements;
- One (1) final determination involves falsification of payroll records or the kickback of wages and/or supplements.

The agency issuing the determination and providing the information, is denoted under the heading 'Fiscal Officer'. DOL = New York State Department of Labor; NYC = New York City Comptroller's Office; AG = New York State Attorney General's Office; DA = County District Attorney's Office.

Debarment Database: To search for contractors, sub-contractors and/or their successors debarred from bidding or being awarded any public work contract or subcontract under NYS Labor Law Articles 8 and 9, or under NYS Workers' Compensation Law Section 141-b, access the database at this link: <https://applications.labor.ny.gov/EDList/searchPage.do>

For inquiries where WCB is listed as the "Agency", please call 1-866-546-9322

NYSDOL Bureau of Public Work Debarment List 08/29/2022

Article 8

AGENCY	Fiscal Officer	FEIN	EMPLOYER NAME	EMPLOYER DBA NAME	ADDRESS	DEBARMENT START DATE	DEBARMENT END DATE
DOL	DOL	*****5754	0369 CONTRACTORS, LLC		515 WEST AVE UNIT PH 13NORWALK CT 06850	05/12/2021	05/12/2026
DOL	DOL	*****4018	ADIRONDACK BUILDING RESTORATION INC.		4156 WILSON ROAD EAST TABERG NY 13471	03/26/2019	03/26/2024
DOL	AG	*****1812	ADVANCED BUILDERS & LAND DEVELOPMENT, INC.		400 OSER AVE #2300HAUPPAUGE NY 11788	09/11/2019	09/11/2024
DOL	DOL	*****1687	ADVANCED SAFETY SPRINKLER INC		261 MILL ROAD P.O BOX 296EAST AURORA NY 14052	05/29/2019	05/29/2024
DOL	NYC	*****6775	ADVENTURE MASONRY CORP.		1535 RICHMOND AVENUE STATEN ISLAND NY 10314	12/13/2017	12/13/2022
DOL	NYC		AGOSTINHO TOME		405 BARRETTO ST BRONX NY 10474	05/31/2018	05/31/2023
DOL	NYC		AMJED PARVEZ		401 HANOVER AVENUE STATEN ISLAND NY 10304	01/11/2021	01/11/2026
DOL	DOL		ANGELO F COKER		2610 SOUTH SALINA STREET SUITE 14SYRACUSE NY 13205	09/17/2020	09/17/2025
DOL	DOL		ANGELO F COKER		2610 SOUTH SALINA STREET SUITE 14SYRACUSE NY 13205	12/04/2018	12/04/2023
DOL	DOL		ANGELO GARCIA		515 WEST AVE UNIT PH 13NORWALK CT 06850	05/12/2021	05/12/2026
DOL	DOL		ANITA SALERNO		158 SOLAR ST SYRACUSE NY 13204	01/07/2019	01/07/2024
DOL	DOL		ANTONIO ESTIVEZ		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	NYC		ARADCO CONSTRUCTION CORP		115-46 132RD ST SOUTH OZONE PARK NY 11420	09/17/2020	09/17/2025
DOL	DOL		ARNOLD A. PAOLINI		1250 BROADWAY ST BUFFALO NY 14212	02/03/2020	02/03/2025
DOL	NYC		ARSHAD MEHMOOD		168-42 88TH AVENUE JAMAICA NY 11432	11/20/2019	11/20/2024
DOL	NYC	*****2591	AVI 212 INC.		260 CROSEY AVENUE APT 11GBROOKLYN NY 11214	10/30/2018	10/30/2023
DOL	NYC		AVM CONSTRUCTION CORP		117-72 123RD ST SOUTH OZONE PARK NY 11420	09/17/2020	09/17/2025
DOL	NYC		AZIDABEGUM		524 MCDONALD AVENUE BROOKLYN NY 11218	09/17/2020	09/17/2025
DOL	DOL	*****8421	B & B DRYWALL, INC		206 WARREN AVE APT 1WHITE PLAINS NY 10603	12/14/2021	12/14/2026
DOL	NYC		BALWINDER SINGH		421 HUDSON ST SUITE C5NEW YORK NY 10014	02/20/2019	02/20/2024
DOL	NYC	*****8416	BEAM CONSTRUCTION, INC.		50 MAIN ST WHITE PLAINS NY 10606	01/04/2019	01/04/2024
DOL	DOL		BERNARD BEGLEY		38 LONG RIDGE ROAD BEDFORD NY 10506	12/18/2019	12/18/2024
DOL	NYC	*****2113	BHW CONTRACTING, INC.		401 HANOVER AVENUE STATEN ISLAND NY 10304	01/11/2021	01/11/2026
DOL	DOL		BIAGIO CANTISANI			06/12/2018	06/12/2023
DOL	DOL	*****3627	BJB CONSTRUCTION CORP.		38 LONG RIDGE ROAD BEDFORD NY 10506	12/18/2019	12/18/2024
DOL	DOL	*****4512	BOB BRUNO EXCAVATING, INC		5 MORNINGSIDE DR AUBURN NY 13021	05/28/2019	05/28/2024
DOL	DOL		BOGDAN MARKOVSKI		370 W. PLEASANTVIEW AVE SUITE 2.329HACKENSACK NJ 07601	02/11/2019	02/11/2024
DOL	DOL		BRADLEY J SCHUKA		4 BROTHERS ROAD WAPPINGERS FALLS NY 12590	10/20/2020	10/20/2025
DOL	DOL		BRUCE P. NASH JR.		5841 BUTTERNUT ROAD EAST SYRACUSE NY 13057	09/12/2018	09/12/2023
DOL	DOL	*****0225	C&D LAFACE CONSTRUCTION, INC.		8531 OSWEGO RD BALDWINSVILLE NY 13027	02/03/2020	01/09/2023
DOL	DOL	*****9383	C.C. PAVING AND EXCAVATING, INC.		2610 SOUTH SALINA ST SUITE 12SYRACUSE NY 13205	09/17/2020	09/17/2025
DOL	DOL	*****9383	C.C. PAVING AND EXCAVATING, INC.		2610 SOUTH SALINA ST SUITE 12SYRACUSE NY 13205	12/04/2018	12/04/2023
DOL	DOL	*****4083	C.P.D. ENTERPRISES, INC		P.O BOX 281 WALDEN NY 12586	03/03/2020	03/03/2025

NYSDOL Bureau of Public Work Debarment List 08/29/2022

Article 8

DOL	DOL	*****3391	CALI ENTERPRISES, INC.		1223 PARK STREET PEEKSKILL NY 10566	05/17/2021	05/17/2026
DOL	NYC		CALVIN WALTERS		465 EAST THIRD ST MT. VERNON NY 10550	09/09/2019	09/09/2024
DOL	DOL		CANTISANI & ASSOCIATES LTD		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL		CANTISANI HOLDING LLC			06/12/2018	06/12/2023
DOL	DOL		CARMEN RACHETTA		8531 OSWEGO RD BALDWINVILLE NY 13027	02/03/2020	02/03/2025
DOL	DOL		CARMENA RACHETTA		8531 OSWEGO ROAD BALDWINVILLE NY 13027	02/03/2020	01/09/2023
DOL	DOL	*****3812	CARMODY "2" INC			06/12/2018	06/12/2023
DOL	DOL	*****1143	CARMODY BUILDING CORP	CARMODY CONTRACTING AND CARMODY CONTRACTING CORP.	442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL		CARMODY CONCRETE CORPORATION			06/12/2018	06/12/2023
DOL	DOL		CARMODY ENTERPRISES, LTD.		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL		CARMODY INC		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL	*****3812	CARMODY INDUSTRIES INC			06/12/2018	06/12/2023
DOL	DOL		CARMODY MAINTENANCE CORPORATION		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL		CARMODY MASONRY CORP		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	AG	*****7247	CENTURY CONCRETE CORP		2375 RAYNOR ST RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	AG		CESAR J. AGUDELO		81-06 34TH AVENUE APT. 6E JACSON HEIGHTS NY 11372	02/07/2018	02/07/2023
DOL	DOL	*****0026	CHANTICLEER CONSTRUCTION LLC		4 BROTHERS ROAD WAPPINGERS FALLS NY 12590	10/20/2020	10/20/2025
DOL	NYC		CHARLES ZAHRADKA		863 WASHINGTON STREET FRANKLIN SQUARE NY 11010	03/10/2020	03/10/2025
DOL	DOL		CHRISTOPHER GRECO		26 NORTH MYRTLE AVENUE SPRING VALLEY NY 10956	02/18/2021	02/18/2026
DOL	DOL		CHRISTOPHER J MAINI		19 CAITLIN AVE JAMESTOWN NY 14701	09/17/2018	09/17/2023
DOL	DOL		CHRISTOPHER PAPASTEFANOU A/K/A CHRIS PAPASTEFANOU		1445 COMMERCE AVE BRONX NY 10461	05/30/2019	05/30/2024
DOL	DOL	*****1927	CONSTRUCTION PARTS WAREHOUSE, INC.	CPW	5841 BUTTERNUT ROAD EAST SYRACUSE NY 13057	09/12/2018	09/12/2023
DOL	DOL	*****3228	CROSS-COUNTY LANDSCAPING AND TREE SERVICE, INC.	ROCKLAND TREE SERVICE	26 NORTH MYRTLE AVENUE SPRING VALLEY NY 10956	02/18/2021	02/18/2026
DOL	DOL	*****2524	CSI ELECTRICAL & MECHANICAL INC		42-32 235TH ST DOUGLSTON NY 11363	01/14/2019	01/14/2024
DOL	NYC		DALJIT KAUR BOPARAI		185-06 56TH AVE FRESH MEADOW NY 11365	10/17/2017	10/17/2022
DOL	DOL	*****7619	DANCO CONSTRUCTION UNLIMITED INC.		485 RAFT AVENUE HOLBROOK NY 11741	10/19/2021	10/19/2026
DOL	DOL		DARIAN L COKER		2610 SOUTH SALINA ST SUITE 2CSYRACUSE NY 13205	09/17/2020	09/17/2025
DOL	DOL		DARIAN L COKER		2610 SOUTH SALINA ST SUITE 2CSYRACUSE NY 13205	12/04/2018	12/04/2023
DOL	NYC		DAVID WEINER		14 NEW DROP LANE 2ND FLOORSTATEN ISLAND NY 10306	11/14/2019	11/14/2024
DOL	AG		DEBRA MARTINEZ		31 BAY ST BROOKLYN NY 11231	03/28/2018	03/28/2023
DOL	DOL		DELPHI PAINTING & DECORATING CO INC		1445 COMMERCE AVE BRONX NY 10461	05/30/2019	05/30/2024
DOL	DOL		DOMENICO LAFACE		8531 OSWEGO RD BALDWINVILLE NY 13027	02/03/2020	01/09/2023
DOL	DOL	*****5175	EAGLE MECHANICAL AND GENERAL CONSTRUCTION LLC		11371 RIDGE RD WOLCOTT NY 14590	02/03/2020	02/03/2025

NYSDOL Bureau of Public Work Debarment List 08/29/2022

Article 8

DOL	DOL		EAST COAST PAVING		2238 BAKER RD GILLET PA 16923	03/12/2018	03/12/2023
DOL	AG		EDWIN HUTZLER		23 NORTH HOWELLS RD BELLPORT NY 11713	08/04/2021	08/04/2026
DOL	DA		EDWIN HUTZLER		2375 RAYNOR STREET RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	*****0780	EMES HEATING & PLUMBING CONTR		5 EMES LANE MONSEY NY 10952	01/20/2002	01/20/3002
DOL	NYC	*****5917	EPOCH ELECTRICAL, INC		97-18 50TH AVE CORONA NY 11368	04/19/2018	04/19/2024
DOL	DOL		FAIGY LOWINGER		11 MOUNTAIN RD 28 VAN BUREN DRMONROE NY 10950	03/20/2019	03/20/2024
DOL	DOL		FRANK BENEDETTO		19 CATLIN AVE JAMESTOWN NY 14701	09/17/2018	09/17/2023
DOL	DOL	*****4722	FRANK BENEDETTO AND CHRISTOPHER J MAINI	B & M CONCRETE	19 CAITLIN AVE JAMESTOWN NY 14701	09/17/2018	09/17/2023
DOL	NYC		FRANK MAINI		1766 FRONT ST YORKTOWN HEIGHTS NY 10598	01/17/2018	01/17/2023
DOL	DA		FREDERICK HUTZLER		2375 RAYNOR STREET RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	NYC	*****6616	G & G MECHANICAL ENTERPRISES, LLC.		1936 HEMPSTEAD TURNPIKE EAST MEDOW NY 11554	11/29/2019	11/29/2024
DOL	DOL		GABRIEL FRASSETTI			04/10/2019	04/10/2024
DOL	NYC		GAYATRI MANGRU		21 DAREWOOD LANE VALLEY STREAM NY 11581	09/17/2020	09/17/2025
DOL	DOL		GEOFF CORLETT		415 FLAGGER AVE #302STUART FL 34994	10/31/2018	10/31/2023
DOL	DA		GEORGE LUCEY		150 KINGS STREET BROOKLYN NY 11231	01/19/1998	01/19/2998
DOL	DOL		GIGI SCHNECKENBURGER		261 MILL RD EAST AURORA NY 14052	05/29/2019	05/29/2024
DOL	DOL		GIOVANNI LAFACE		8531 OSWEGO RD BALDWINVILLE NY 13027	02/03/2020	01/09/2023
DOL	NYC	*****3164	GLOBE GATES INC	GLOBAL OVERHEAD DOORS	405 BARRETTO ST BRONX NY 10474	05/31/2018	05/31/2023
DOL	NYC		GREAT ESTATE CONSTRUCTION, INC.		327 STAGG ST BROOKLYN NY 11206	10/10/2017	10/10/2022
DOL	DOL		GREGORY S. OLSON		P.O BOX 100 200 LATTA BROOK PARKHORSEHEADS NY 14845	03/08/2018	03/08/2023
DOL	DOL		HANS RATH		24 ELDOR AVENUE NEW CITY NY 10956	02/03/2020	02/03/2025
DOL	NYC	*****3228	HEIGHTS ELEVATOR CORP.		1766 FRONT ST YORKTOWN HEIGHTS NY 10598	01/17/2018	01/17/2023
DOL	DOL	*****5131	INTEGRITY MASONRY, INC.	M&R CONCRETE	722 8TH AVE WATERVLIET NY 12189	06/05/2018	06/05/2023
DOL	DOL		IRENE KASELIS		32 PENNINGTON AVE WALDWICK NJ 07463	05/30/2019	05/30/2024
DOL	DOL	*****9211	J. WASE CONSTRUCTION CORP.		8545 RT 9W ATHENS NY 12015	03/09/2021	03/09/2026
DOL	DOL		J.A. HIRES CADWALLADER		P.O BOX 100 200 LATTA BROOK PARKHORSEHEADS NY 14845	03/08/2018	03/08/2023
DOL	DOL		JAMES C. DELGIACCO		722 8TH AVE WATERVLIET NY 12189	06/05/2018	06/05/2023
DOL	DOL		JAMES J. BAKER		7901 GEE ROAD CANASTOTA NY 13032	08/17/2021	08/17/2026
DOL	DOL		JAMES LIACONE		9365 WASHINGTON ST LOCKPORT IL 60441	07/23/2018	07/23/2023
DOL	DOL		JAMES RACHEL		9365 WASHINGTON ST LOCKPORT IL 60441	07/23/2018	07/23/2023
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	09/29/2021	09/29/2026
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	02/09/2022	02/09/2027
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL	*****7993	JBS DIRT, INC.		7901 GEE ROAD CANASTOTA NY 13032	08/17/2021	08/17/2026

NYSDOL Bureau of Public Work Debarment List 08/29/2022

Article 8

DOL	NYC		JENNIFER GUERRERO		1936 HEMPSTEAD TURNPIKE EAST MEADOW NY 11554	11/29/2019	11/29/2024
DOL	DOL		JIM PLAUGHER		17613 SANTE FE LINE ROAD WAYNEFIELD OH 45896	07/16/2021	07/16/2026
DOL	AG		JOHN ANTHONY MASSINO		36-49 204TH STREET BAYSIDE NY 11372	02/07/2018	02/07/2023
DOL	DOL		JOHN F. CADWALLADER		200 LATTA BROOK PARK HORSEHEADS NY 14845	03/08/2018	03/08/2023
DOL	DOL	*****4612	JOHN F. CADWALLADER, INC.	THE GLASS COMPANY	P.O BOX 100 200 LATTA BROOK PARKHORSEHEADS NY 14845	03/08/2018	03/08/2023
DOL	DOL		JOHN GOCEK		14B COMMERCIAL AVE ALBANY NY 12065	11/14/2019	11/14/2024
DOL	DOL		JOHN LUCIANO			05/14/2018	05/14/2023
DOL	DOL		JOHN MARKOVIC		47 MANDON TERRACE HAWTHORN NJ 07506	03/29/2021	03/29/2026
DOL	DOL		JOHN WASE		8545 RT 9W ATHENS NY 12015	03/09/2021	03/09/2026
DOL	AG	*****0600	JOHNCO CONTRACTING, INC.		36-49 204TH STREET BAYSIDE NY 11372	02/07/2018	02/07/2023
DOL	DOL		JON E DEYOUNG		261 MILL RD P.O BOX 296EAST AURORA NY 14052	05/29/2019	05/29/2024
DOL	DOL		JORGE RAMOS		8970 MIKE GARCIA DR MANASSAS VA 20109	07/16/2021	07/16/2026
DOL	DOL		JORI PEDERSEN		415 FLAGER AVE #302STUART FL 34994	10/31/2018	10/31/2023
DOL	DOL		JOSE CHUCHUCA		35 CLINTON AVE OSSINING NY 10562	09/12/2018	09/12/2023
DOL	NYC		JOSEPH MARTINO		1535 RICHMOND AVENUE STATEN ISLAND NY 10314	12/13/2017	12/13/2022
DOL	DOL		JOY MARTIN		2404 DELAWARE AVE NIGARA FALLS NY 14305	09/12/2018	09/12/2023
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	02/09/2022	02/09/2027
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	09/29/2021	09/29/2026
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL		JULIUS AND GITA BEHREND		5 EMES LANE MONSEY NY 10952	11/20/2002	11/20/3002
DOL	DOL		KARIN MANGIN		796 PHELPS ROAD FRANKLIN LAKES NJ 07417	12/01/2020	12/01/2025
DOL	DOL		KATE E. CONNOR		7088 INTERSTATE ISLAND RD SYRACUSE NY 13209	03/31/2021	03/31/2026
DOL	DOL		KATIE BURDICK		2238 BAKER RD GILLET PA 16923	03/12/2018	03/12/2023
DOL	DOL	*****2959	KELC DEVELOPMENT, INC		7088 INTERSTATE ISLAND RD SYRACUSE NY 13209	03/31/2021	03/31/2026
DOL	DOL		KIMBERLY F. BAKER		7901 GEE ROAD CANASTOTA NY 13032	08/17/2021	08/17/2026
DOL	DOL	*****3490	L & M CONSTRUCTION/DRYWALL INC.		1079 YONKERS AVE YONKERS NY 10704	08/07/2018	08/07/2023
DOL	DA	*****8816	LAKE CONSTRUCTION AND DEVELOPMENT CORPORATION		150 KINGS STREET BROOKLYN NY 11231	08/19/1998	08/19/2998
DOL	DOL		LAVERN GLAVE		161 ROBYN RD MONROE NY 10950	01/30/2018	01/30/2023
DOL	DOL	*****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	06/24/2016	09/19/2022
DOL	DOL	*****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	06/24/2016	09/19/2022
DOL	DOL	*****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL	*****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL	*****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	01/17/2017	09/19/2022
DOL	DOL	*****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022

NYSDOL Bureau of Public Work Debarment List 08/29/2022

Article 8

DOL	DOL	****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL	****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	08/14/2017	09/19/2022
DOL	DOL		LEROY NELSON JR		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL		LEROY NELSON JR		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL		LEROY NELSON JR		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL		LEROY NELSON JR		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL		LEROY NELSON JR		PO BOX 10007 ALBANY NY 12201	01/17/2017	09/19/2022
DOL	AG	****3291	LINTECH ELECTRIC, INC.		3006 TILDEN AVE BROOKLYN NY 11226	02/16/2022	02/16/2027
DOL	DA	****4460	LONG ISLAND GLASS & STOREFRONTS, LLC		4 MANHASSET TRL RIDGE NY 11961	09/06/2018	09/06/2023
DOL	AG	****4216	LOTUS-C CORP.		81-06 34TH AVENUE APT. 6EJACKSON HEIGHTS NY 11372	02/07/2018	02/07/2023
DOL	DOL		LOUIS A. CALICCHIA		1223 PARK ST. PEEKSKILL NY 10566	05/17/2021	05/17/2026
DOL	NYC		LUBOMIR PETER SVOBODA		27 HOUSMAN AVE STATEN ISLAND NY 10303	12/26/2019	12/26/2024
DOL	NYC		M & L STEEL & ORNAMENTAL IRON CORP.		27 HOUSMAN AVE STATEN ISLAND NY 10303	12/26/2019	12/26/2024
DOL	DOL	****2196	MAINSTREAM SPECIALTIES, INC.		11 OLD TOWN RD SELKIRK NY 12158	02/02/2021	02/02/2026
DOL	DA		MANUEL P TOBIO		150 KINGS STREET BROOKLYN NY 14444	08/19/1998	08/19/2998
DOL	DA		MANUEL TOBIO		150 KINGS STREET BROOKLYN NY 11231	08/19/1998	08/19/2998
DOL	NYC		MAREK FABIJANOWSKI		50 MAIN ST WHITE PLAINS NY 10606	01/04/2019	01/04/2024
DOL	NYC		MARIA NUBILE		84-22 GRAND AVENUE ELMHURST NY 11373	03/10/2020	03/10/2025
DOL	DOL		MASONRY CONSTRUCTION, INC.		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL	****3333	MASONRY INDUSTRIES, INC.		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	NYC		MATINA KARAGIANNIS		97-18 50TH AVE CORONA NY 11368	04/19/2018	04/19/2023
DOL	DOL		MATTHEW P. KILGORE		4156 WILSON ROAD EAST TABERG NY 13471	03/26/2019	03/26/2024
DOL	DOL		MAURICE GAWENO		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL		MICHAEL LENIHAN		1079 YONKERS AVE UNIT 4YONKERS NY 10704	08/07/2018	08/07/2023
DOL	AG		MICHAEL RIGLIETTI		31 BAY ST BROOKLYN NY 11231	03/28/2018	03/28/2023
DOL	DOL	****4829	MILESTONE ENVIRONMENTAL CORPORATION		704 GINESI DRIVE SUITE 29MORGANVILLE NJ 07751	04/10/2019	04/10/2024
DOL	NYC	****9926	MILLENNIUM FIRE PROTECTION, LLC		325 W. 38TH STREET SUITE 204NEW YORK NY 10018	11/14/2019	11/14/2024
DOL	NYC	****0627	MILLENNIUM FIRE SERVICES, LLC		14 NEW DROP LNE 2ND FLOORSTATEN ISLAND NY 10306	11/14/2019	11/14/2024
DOL	AG		MSR ELECTRICAL CONSTRUCTION CORP.		31 BAY ST BROOKLYN NY 11231	03/28/2018	03/28/2023
DOL	NYC		MUHAMMED A. HASHEM		524 MCDONALD AVENUE BROOKLYN NY 11218	09/17/2020	09/17/2025
DOL	NYC		NAMOW, INC.		84-22 GRAND AVENUE ELMHURST NY 11373	03/10/2020	03/10/2025
DOL	DA	****9786	NATIONAL INSULATION & GC CORP		180 MILLER PLACE HICKSVILLE NY 11801	12/12/2018	12/12/2023
DOL	DOL	****3684	NATIONAL LAWN SPRINKLERS, INC.		645 N BROADWAY WHITE PLAINS NY 10603	05/14/2018	05/14/2023
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	09/29/2021	09/29/2026

NYSDOL Bureau of Public Work Debarment List 08/29/2022

Article 8

DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	02/09/2022	02/09/2027
DOL	DOL	*****7429	NICOLAE I. BARBIR	BESTUCCO CONSTRUCTION, INC.	444 SCHANTZ ROAD ALLENTOWN PA 18104	09/17/2020	09/17/2025
DOL	DOL	*****1845	OC ERECTERS, LLC A/K/A OC ERECTERS OF NY INC.		1207 SW 48TH TERRACE DEERFIELD BEACH FL 33442	01/16/2018	01/16/2023
DOL	DOL		PAULINE CHAHALES		935 S LAKE BLVD MAHOPAC NY 10541	03/02/2021	03/02/2026
DOL	DOL		PETER STEVENS		11 OLD TOWN ROAD SELKIRK NY 12158	02/02/2021	02/02/2026
DOL	DOL	*****0466	PRECISION BUILT FENCES, INC.		1617 MAIN ST PEEKSKILL NY 10566	03/03/2020	03/03/2025
DOL	NYC		RASHEL CONSTRUCTION CORP		524 MCDONALD AVENUE BROOKLYN NY 11218	09/17/2020	09/17/2025
DOL	DOL	*****1068	RATH MECHANICAL CONTRACTORS, INC.		24 ELDOR AVENUE NEW CITY NY 10956	02/03/2020	02/03/2025
DOL	DOL	*****2633	RAW POWER ELECTRIC CORP.		3 PARK CIRCLE MIDDLETOWN NY 10940	01/30/2018	01/30/2023
DOL	DOL	*****2633	RAW POWER ELECTRIC CORP.		3 PARK CIRCLE MIDDLETOWN NY 10940	07/11/2022	07/11/2027
DOL	AG	*****7015	RCM PAINTING INC.		69-06 GRAND AVENUE 2ND FLOORMASPETH NY 11378	02/07/2018	02/07/2023
DOL	DA	*****7559	REGAL CONTRACTING INC.		24 WOODBINE AVE NORTHPORT NY 11768	10/01/2020	10/01/2025
DOL	DOL		REGINALD WARREN		161 ROBYN RD MONROE NY 10950	01/30/2018	01/30/2023
DOL	DOL	*****9148	RICH T CONSTRUCTION		107 WILLOW WOOD LANE CAMILLUS NY 13031	11/13/2018	11/13/2023
DOL	DOL		RICHARD MACONE		8617 THIRD AVE BROOKLYN NY 11209	09/17/2018	09/17/2023
DOL	DOL		RICHARD REGGIO		1617 MAIN ST PEEKSKILL NY 10566	03/03/2020	03/03/2025
DOL	DOL	*****9148	RICHARD TIMIAN	RICH T CONSTRUCTION	108 LAMONT AVE SYRACUSE NY 13209	10/16/2018	10/16/2023
DOL	DOL		RICHARD TIMIAN JR.		108 LAMONT AVE SYRACUSE NY 13209	10/16/2018	10/16/2023
DOL	DOL		RICHARD TIMIAN JR.		108 LAMONT AVE SYRACUSE NY 13209	11/13/2018	11/13/2023
DOL	DOL		ROBBYE BISSESAR		89-51 SPRINGFIELD BLVD QUEENS VILLAGE NY 11427	01/11/2003	01/11/3003
DOL	DOL		ROBERT A. VALERINO		3841 LANYARD COURT NEW PORT RICHEY FL 34652	07/09/2019	07/09/2024
DOL	DOL		ROBERT BRUNO		5 MORNINGSIDE DRIVE AUBURN NY 13021	05/28/2019	05/28/2024
DOL	DOL		RODERICK PUGH		404 OAK ST SUITE 101SYRACUSE NY 13203	07/23/2018	07/23/2023
DOL	DOL	*****4880	RODERICK PUGH CONSTRUCTION INC.		404 OAK ST SUITE 101SYRACUSE NY 13203	07/23/2018	07/23/2023
DOL	DOL		ROMEO WARREN		161 ROBYN RD MONROE NY 10950	01/30/2018	01/30/2023
DOL	DOL		ROMEO WARREN		161 ROBYN RD MONROE NY 10950	07/11/2022	07/11/2027
DOL	DOL		RONALD MESSEN		14B COMMERCIAL AVE ALBANY NY 12065	11/14/2019	11/14/2024
DOL	DOL		ROSEANNE CANTISANI			06/12/2018	06/12/2023
DOL	DOL	*****1365	S & L PAINTING, INC.		11 MOUNTAIN ROAD P.O BOX 408MONROE NY 10950	03/20/2019	03/20/2024
DOL	DOL	*****7730	S C MARTIN GROUP INC.		2404 DELAWARE AVE NIAGARA FALLS NY 14305	09/12/2018	09/12/2023
DOL	DOL		SAL FRESINA MASONRY CONTRACTORS, INC.		1935 TEALL AVENUE SYRACUSE NY 13206	07/16/2021	07/16/2026
DOL	DOL		SAL MASONRY CONTRACTORS, INC.		(SEE COMMENTS) SYRACUSE NY 13202	07/16/2021	07/16/2026
DOL	DOL	*****9874	SALFREE ENTERPRISES INC		P.O BOX 14 2821 GARDNER RDPOMPEI NY 13138	07/16/2021	07/16/2026
DOL	DOL		SALVATORE A FRESINA A/K/A SAM FRESINA		107 FACTORY AVE P.O BOX 11070SYRACUSE NY	07/16/2021	07/16/2026

NYSDOL Bureau of Public Work Debarment List 08/29/2022

Article 8

DOL	DOL		SAM FRESINA		107 FACTORY AVE P.O BOX 11070SYRACUSE NY 13218	07/16/2021	07/16/2026
DOL	NYC	*****0349	SAM WATERPROOFING INC		168-42 88TH AVENUE APT.1 AJAMAICA NY 11432	11/20/2019	11/20/2024
DOL	NYC		SANDEEP BOPARAI		185-06 56TH AVE FRESH MEADOW NY 11365	10/17/2017	10/17/2022
DOL	NYC	*****1130	SCANA CONSTRUCTION CORP.		863 WASHINGTON STREET FRANKLIN SQUARE NY 11010	03/10/2020	03/10/2025
DOL	DOL	*****2045	SCOTT DUFFIE	DUFFIE'S ELECTRIC, INC.	P.O BOX 111 CORNWALL NY 12518	03/03/2020	03/03/2025
DOL	DOL		SCOTT DUFFIE		P.O BOX 111 CORNWALL NY 12518	03/03/2020	03/03/2025
DOL	NYC	*****6597	SHAIRA CONSTRUCTION CORP.		421 HUDSON STREET SUITE C5NEW YORK NY 10014	02/20/2019	02/20/2024
DOL	DOL	*****1961	SHANE BURDICK	CENTRAL TRAFFIC CONTROL, LLC.	2238 BAKER ROAD GILLET PA 16923	03/12/2018	03/12/2023
DOL	DOL		SHANE BURDICK		2238 BAKER ROAD GILLET PA 16923	03/12/2018	03/12/2023
DOL	DOL		SHANE NOLAN		9365 WASHINGTON ST LOCKPORT IL 60441	07/23/2018	07/23/2023
DOL	DOL		SHULEM LOWINGER		11 MOUNTAIN ROAD 28 VAN BUREN DRMONROE NY 10950	03/20/2019	03/20/2024
DOL	DOL	*****0816	SOLAR ARRAY SOLUTIONS, LLC		9365 WASHINGTON ST LOCKPORT IL 60441	07/23/2018	07/23/2023
DOL	DOL	*****0440	SOLAR GUYS INC.		8970 MIKE GARCIA DR MANASSAS VA 20109	07/16/2021	07/16/2026
DOL	NYC		SOMATIE RAMSUNAHAI		115-46 132ND ST SOUTH OZONE PARK NY 11420	09/17/2020	09/17/2025
DOL	DOL	*****2221	SOUTH BUFFALO ELECTRIC, INC.		1250 BROADWAY ST BUFFALO NY 14212	02/03/2020	02/03/2025
DOL	DOL	*****3661	SPANIER BUILDING MAINTENANCE CORP		200 OAK DRIVE SYOSSET NY 11791	03/14/2022	03/14/2027
DOL	DOL		STANADOS KALOGELAS		485 RAFT AVENUE HOLBROOK NY 11741	10/19/2021	10/19/2026
DOL	DOL	*****3496	STAR INTERNATIONAL INC		89-51 SPRINGFIELD BLVD QUEENS VILLAGE NY 11427	08/11/2003	08/11/3003
DOL	DOL	*****6844	STEAM PLANT AND CHX SYSTEMS INC.		14B COMMERCIAL AVENUE ALBANY NY 12065	11/14/2019	11/14/2024
DOL	DOL	*****9933	STEED GENERAL CONTRACTORS, INC.		1445 COMMERCE AVE BRONX NY 10461	05/30/2019	05/30/2024
DOL	DOL	*****9528	STEEL-IT, LLC.		17613 SANTE FE LINE ROAD WAYNESFIELD OH 45896	07/16/2021	07/16/2026
DOL	DOL		STEFANOS PAPASTEFANOU, JR. A/K/A STEVE PAPASTEFANOU, JR.		256 WEST SADDLE RIVER RD UPPER SADDLE RIVER NJ 07458	05/30/2019	05/30/2024
DOL	DOL		STEVE TATE		415 FLAGER AVE #302STUART FL 34994	10/31/2018	10/31/2023
DOL	DOL		STEVEN MARTIN		2404 DELWARE AVE NIAGARA FALLS NY 14305	09/12/2018	09/12/2023
DOL	DOL	*****3800	SUBURBAN RESTORATION CO. INC.		5-10 BANTA PLACE FAIR LAWN PLACE NJ 07410	03/29/2021	03/29/2026
DOL	NYC	*****5863	SUKHMANY CONSTRUCTION, INC.		185-06 56TH AVE FRESH MEADOW NY 11365	10/17/2017	10/17/2022
DOL	DOL	*****1060	SUNN ENTERPRISES GROUP, LLC		370 W. PLEASANTVIEW AVE SUITE 2.329HACKENSACK NJ 07601	02/11/2019	02/11/2024
DOL	DOL	*****8209	SYRACUSE SCALES, INC.		158 SOLAR ST SYRACUSE NY 13204	01/07/2019	01/07/2024
DOL	DOL		TALAILA OCAMPA		1207 SW 48TH TERRACE DEERFIELD BEACH FL 33442	01/16/2018	01/16/2023
DOL	DOL		TERRY THOMPSON		11371 RIDGE RD WOLCOTT NY 14590	02/03/2020	02/03/2025
DOL	DOL	*****9733	TERSAL CONSTRUCTION SERVICES INC		107 FACTORY AVE P.O BOX 11070SYRACUSE NY 13208	07/16/2021	07/16/2026
DOL	DOL		TERSAL CONTRACTORS, INC.		221 GARDNER RD P.O BOX 14POMPEI NY 13138	07/16/2021	07/16/2026
DOL	DOL		TERSAL DEVELOPMENT CORP.		1935 TEALL AVENUE SYRACUSE NY 13206	07/16/2021	07/16/2026

NYSDOL Bureau of Public Work Debarment List 08/29/2022

Article 8

DOL	DOL		TEST		P.O BOX 123 ALBANY NY 12204	05/20/2020	05/20/2025
DOL	DOL	*****6789	TEST1000		P.O BOX 123 ALBANY NY 12044	03/01/2021	03/01/2026
DOL	DOL	*****5766	THE COKER CORPORATION	COKER CORPORATIO N	2610 SOUTH SALINA ST SUITE 14SYRACUSE NY 13205	12/04/2018	12/04/2023
DOL	DOL	*****5766	THE COKER CORPORATION	COKER CORPORATIO N	2610 SOUTH SALINA ST SUITE 14SYRACUSE NY 13205	09/17/2020	09/17/2025
DOL	DA	*****4106	TRIPLE H CONCRETE CORP		2375 RAYNOR STREET RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	*****6392	V.M.K CORP.		8617 THIRD AVE BROOKLYN NY 11209	09/17/2018	09/17/2023
DOL	DOL	*****6418	VALHALLA CONSTRUCTION, LLC.		796 PHELEPS ROAD FRANKLIN LAKES NJ 07417	12/01/2020	12/01/2025
DOL	NYC	*****2426	VICKRAM MANGRU	VICK CONSTRUCTI ON	21 DAREWOOD LANE VALLEY STREAM NY 11581	09/17/2020	09/17/2025
DOL	NYC		VICKRAM MANGRU		21 DAREWOOD LANE VALLEY STREAM NY 11581	09/17/2020	09/17/2025
DOL	DOL		VICTOR ALICANTI		42-32 235TH ST DOUGLASTON NY 11363	01/14/2019	01/14/2024
DOL	NYC		VIKTAR PATONICH		2630 CROPSEY AVE BROOKLYN NY 11214	10/30/2018	10/30/2023
DOL	DOL		VIKTORIA RATH		24 ELDOR AVENUE NEW CITY NY 10956	02/03/2020	02/03/2025
DOL	NYC		VITO GARGANO		1535 RICHMOND AVE STATEN ISLAND NY 10314	12/13/2017	12/13/2022
DOL	NYC	*****3673	WALTERS AND WALTERS, INC.		465 EAST AND THIRD ST MT. VERNON NY 10550	09/09/2019	09/09/2024
DOL	DOL	*****3296	WESTERN NEW YORK CONTRACTORS, INC.		3841 LAYNARD COURT NEW PORT RICHEY FL 34652	07/09/2019	07/09/2024
DOL	DOL		WHITE PLAINS CARPENTRY CORP		442 ARMONK RD	06/12/2018	06/12/2023
DOL	DOL		WILLIAM G. PROERFRIEDT		85 SPRUCEWOOD ROAD WEST BABYLON NY 11704	01/19/2021	01/19/2026
DOL	DOL	*****5924	WILLIAM G. PROPHY, LLC	WGP CONTRACTIN G, INC.	54 PENTAQUIT AVE BAYSHORE NY 11706	01/19/2021	01/19/2026
DOL	DOL	*****4043	WINDSHIELD INSTALLATION NETWORK, INC.		200 LATTA BROOK PARK HORSEHEADS NY 14845	03/08/2018	03/08/2023
DOL	DOL	*****4730	XGD SYSTEMS, LLC	TDI GOLF	415 GLAGE AVE #302STUART FL 34994	10/31/2018	10/31/2023
DOL	NYC		ZAKIR NASEEM		30 MEADOW ST BROOKLYN NY 11206	10/10/2017	10/10/2022
DOL	NYC	*****8277	ZHN CONTRACTING CORP		30 MEADOW ST BROOKLYN NY 11206	10/10/2017	10/10/2022

PROJECT LABOR AGREEMENT (PLA)

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION
Division of Engineering

PROJECT LABOR AGREEMENT
(Contract No. *{Insert Contract Number}*)

COVERING

CONSTRUCTION PERFORMED

ON BEHALF OF

WESTCHESTER COUNTY, NEW YORK

TABLE OF CONTENTS

Article 1 - Preamble 1
 Section 1 - Parties to the Agreement..... 2
Article 2 - General Conditions 2
 Section 1 - Definitions 2
 Section 2 - Conditions for Agreement to Become Effective..... 2
 Section 3 - Entities Bound & Administration of Agreement 2
 Section 4 - Supremacy Clause 3
 Section 5 - Liability..... 3
 Section 6 - The County 3
 Section 7 - Availability & Applicability to All Successful Bidders 4
Article 3 - Scope of This Agreement..... 4
 Section 1 - The Work 4
 Section 2 - Excluded Employees..... 4
 Section 3 - Non-Application to Certain Entities 5
 Section 4 - County Liability 5
Article 4 - Union Recognition and Employment 6
 Section 1 - Pre-Hire Recognition 6
 Section 2 - Union’s Referral 6
 Section 3 - Non-Discrimination in Referrals 7
 Section 4 - Minority and Female Referrals 7
 Section 5 - Cross and Qualified Referrals..... 7
 Section 6 - Union Dues 8
 Section 7 - Trade Forepersons and General Forepersons..... 8
Article 5 - Union Representation 8
 Section 1 - Local Union Representative..... 8
 Section 2 - Stewards..... 8
 Section 3 - Layoff of a Steward 9
Article 6 - Management’s Rights 9
 Section 1 - Reservation of Rights 9
 Section 2 - Materials, Methods & Equipment..... 10
Article 7 - Work Stoppages and Lockouts..... 10
 Section 1 - No Strikes - No Lockouts 10
 Section 2 - Discharge for Violation 10
 Section 3 - Notification 10
 Section 4 - Expedited Arbitration 11
 Section 5 - Arbitration of Discharges..... 12
Article 8 - Labor Management Committee..... 12
 Section 1 - Subjects..... 12
 Section 2 - Composition..... 13
Article 9 - Grievance & Arbitration Procedure 13
 Section 1 - Procedure for Resolution of Grievances 13
 Section 2 - Limitation as to Retroactivity 14
Article 10 - Jurisdictional Disputes 14
 Section 1 - No Disruptions..... 14
 Section 2 - Assignment 15
 Section 3 - Procedure for Settlement of Jurisdictional Disputes..... 15

Section 4 - Award	15
Section 5 - Limitations	16
Section 6 - No Interference with Work	16
Article 11 - Wages and Benefits	16
Section 1 - Classification and Base Hourly Rate	16
Section 2 - Employee Benefit Funds.....	16
Article 12 - Hours of Work, Premium Payments, Shifts and Holidays.....	17
Section 1 - Work Week and Work Day	17
Section 2 - Overtime	18
Section 3 - Shifts	18
Section 4 - Holidays.....	19
Section 5 - Reporting Pay	19
Section 6 - Payment Of Wages	20
Section 7 - Emergency Work Suspension.....	20
Section 8 - Injury-Disability	20
Section 9 - Time Keeping	21
Section 10 - Meal Period.....	21
Section 11 - Break Periods.....	21
Article 13 - Apprentices.....	21
Section 1 - Ratios	21
Section 2 - Department of Labor.....	22
Article 14 - Safety Protection of Person and Property	22
Section 1 - Safety Requirements.....	22
Section 2 - Contractor Rules	22
Section 3 - Inspections	22
Article 15 - No Discrimination	22
Section 1 - Cooperative Efforts.....	22
Section 2 - Language of Agreement.....	23
Article 16 - General Terms.....	23
Section 1 - Project Rules	23
Section 2 - Tools of the Trade.....	23
Section 3 - Supervision	23
Section 4 - Travel Allowances	23
Section 5 - Full Work Day	24
Section 6 - Cooperation.....	24
Article 17 - Savings and Separability	24
Section 1 - This Agreement	24
Section 2 - The Bid Specifications.....	24
Section 3 - Non-Liability	24
Section 4 - Non-Waiver	25
Article 18 - Future Changes in Schedule “A” Collective Bargaining Agreements	25
Section 1 - Changes to Collective Bargaining Agreements	25
Section 2 - Labor Disputes during Collective Bargaining Agreement Negotiations	25
Article 19 – Workers’ Compensation ADR	26
Signatures	27
Schedule “A” Local Collective Bargaining Agreements.....	28

**PROJECT LABOR AGREEMENT
COVERING CONSTRUCTION WORK PERFORMED
ON BEHALF OF WESTCHESTER COUNTY, NEW YORK**

ARTICLE 1 - PREAMBLE

WHEREAS, *{Insert Name of Contractor}* (the “Contractor”) on behalf of itself, and reflecting the objectives of the owner, **Westchester County, New York** (the “County”), desires to provide for the efficient, safe, quality, and timely completion of the following construction project: *{Insert Contract Title}* (the “Project”) in a manner designed to afford the lowest reasonable costs to the County and the public it represents, and the advancement of public policy objectives;

WHEREAS, this Project Labor Agreement will foster the achievement of these goals, inter alia, by:

1. avoiding the costly delays of potential strikes, slowdowns, walkouts, picketing and other disruptions arising from work disputes and promote labor harmony and peace for the duration of the Project;
2. standardizing the terms and conditions governing the employment of labor on the Project;
3. permitting wide flexibility in work scheduling and shift hours and times;
4. receiving negotiated adjustments to work rules and staffing requirements from those which otherwise might control;
5. providing comprehensive and standardized mechanisms for the settlement of work disputes, including but not limited to, those relating to jurisdiction;
6. ensuring a reliable source of skilled and experienced labor;
7. furthering public policy objectives as to improved employment opportunities for minorities, women and the economically disadvantaged in the construction industry;
8. minimizing potential losses of revenues through timely completion of contracts;
9. expediting the construction process and otherwise minimizing the inconveniences of citizens of the County; and

WHEREAS, the parties desire to maximize Project safety conditions for both workers and the public;

NOW, THEREFORE, the parties enter into this Agreement:

SECTION 1 - PARTIES TO THE AGREEMENT

This is a Project Labor Agreement (“Agreement”) entered into by and between the Contractor, on behalf of itself and its successors, assigns and its subcontractors engaged in On-Site Project Work as defined in Article 3; and by the Building and Construction Trades Council of Westchester and Putnam Counties, New York AFL-CIO, on behalf of itself and all of its affiliated Local Unions that perform On-Site Project Work and their members.

ARTICLE 2 - GENERAL CONDITIONS

SECTION 1 - DEFINITIONS

Throughout this Agreement, “Council” shall refer to the Building and Construction Trades Council of Westchester and Putnam Counties, New York AFL-CIO. “Local Unions” shall refer to all of the Council’s affiliated Local Unions that perform On-Site Project Work and their members. “Contractor(s)” shall include the Contractor, all other contractors who sign a similar Project Labor Agreement in connection with the Project and their subcontractors of whatever tier, engaged in On-Site Project Work within the scope of this Agreement as defined in Article 3.

SECTION 2 - CONDITIONS FOR AGREEMENT TO BECOME EFFECTIVE

This Agreement shall not become effective unless each of the following conditions is met: (1) the Agreement is signed by the Council on behalf of itself and all of its affiliated Local Unions that perform On-Site Project Work; (2) the Agreement is signed by the Contractor; and (3) the Agreement is approved by the County.

SECTION 3 - ENTITIES BOUND & ADMINISTRATION OF AGREEMENT

This Agreement shall be binding on the Council, the Local Unions and the Contractors performing On-site Project Work, including site preparation and staging areas, as defined in Article 3. The Contractors shall include in any subcontract that they let, for performance during the term of this Agreement, a requirement that each and every one of their subcontractors, of whatever tier, become bound by this Agreement with respect to subcontracted work performed within the scope of Article 3. This Agreement shall be administered by the Contractor, on behalf of itself and its subcontractors. In the event a

Contractor desires to review the provisions of a Local Union's collective bargaining agreement, that Contractor shall request a copy of same from the Council and the Council shall provide same without delay.

SECTION 4 - SUPREMACY CLAUSE

This Agreement together with the applicable collective bargaining agreements of the Local Unions, copies of which can be obtained from the Council, represents the complete understanding of all signatories and supersedes any national agreement, local agreement or collective bargaining agreement of any type which would otherwise apply to this Project, in whole or in part. Where a subject covered by the provisions, explicit or implicit, of this Agreement is also covered by the collective bargaining agreements of one or more of the Local Unions, the provisions of this Agreement shall prevail. It is further understood that no Contractor or subcontractor shall be required to sign any other agreement with the Council or the Local Unions as a condition of performing work on this Project. No practice, understanding or agreement between a Contractor and a Local Union which is not set forth or referenced in this Agreement shall be binding on this Project unless endorsed in writing by the Contractor or subcontractor.

SECTION 5 - LIABILITY

The liability of any Contractor or subcontractor and the liability of any Local Union under this Agreement shall be several and not joint. The Contractor and any subcontractor shall not be liable for any violations of this Agreement by any other contractor, and the Council and Local Unions shall not be liable for any violations of this Agreement by any other Local Union.

SECTION 6 - THE COUNTY

The County requires in its bid specifications that all successful bidders become bound by and signatory to this Agreement for work within the scope of Article 3. In addition, all of their subcontracts shall provide that their subcontractors are subject to all terms and conditions set forth in this Agreement as if signatories thereto. The County is not a party to this Agreement and shall not be liable in any manner under this Agreement. It is understood that nothing in this Agreement shall be construed as limiting the sole discretion of the County in determining which Contractors shall be awarded contracts for Project work; nor as limiting any of the rights or remedies of the County as set forth in any and all of the Contract Documents that pertain in any way to the Project. It is further understood that the County has sole discretion at any time to terminate, delay or suspend the work, in whole or in part, on this Project.

SECTION 7 - AVAILABILITY & APPLICABILITY TO ALL SUCCESSFUL BIDDERS

The Local Unions agree that this Agreement will be made available to, and will fully apply to any successful bidder for Project work who becomes signatory hereto, without regard to whether that successful bidder performs work at other sites on either a union or non-union basis and without regard to whether employees of such successful bidder are, or are not, members of any union. This Agreement shall not apply to the work of any contractor or subcontractor which is performed at any location other than the Project site, as defined in Article 3, Section 1.

ARTICLE 3 - SCOPE OF THIS AGREEMENT

The Project work covered by this Agreement shall be as defined and limited by the following sections of this Article.

SECTION 1 - THE WORK

This Agreement shall only apply to On-Site Project Work performed in connection with the Project.

“On-Site Project Work” shall be defined to include Project work performed at the Project site and preparation and staging areas located within 15 miles of the Project site.

SECTION 2 - EXCLUDED EMPLOYEES

The following persons are not subject to the provisions of this Agreement, even though performing On-Site Project Work:

- a) Superintendents, supervisors (excluding field engineers/supervisors, general and forepersons specifically covered by a Local Union’s collective bargaining agreement), engineers, inspectors and testers, quality control/assurance personnel, timekeepers, mail carriers, clerks, office workers, messengers, guards, technicians, non-manual employees, and all professional, engineering, administrative and management persons;
- b) Employees of the County, or of any State agency, authority or entity or employees of any municipality or other public employer;
- c) Employees and entities engaged in off-site manufacture, modifications, repair, maintenance, assembly, painting, handling or fabrication of components, materials, equipment or machinery or involved in deliveries to and from the Project site, excepting local deliveries of all major

construction materials including fill, ready mix concrete, asphalt and sub-base stone/gravel materials which are covered by this Agreement;

- d) Employees of the Contractor, other contractors or subcontractors excepting those performing manual, on-site construction labor who will be covered by this Agreement;
- e) Employees engaged in on-site equipment maintenance/warranty work. When a Contractor has on site an employee already certified by the relevant manufacturer to make warranty repairs on that Contractor's equipment, that employee shall be used; when a Contractor has on site an employee already qualified to make warranty repairs, although not certified by the equipment manufacturer to do so, that employee shall be used to make repairs working under the direction of a manufacturer certified warranty representative. Notwithstanding the foregoing, if a Contractor, in order to satisfy the warranty requirements of a manufacturer must utilize a person or entity designated by the manufacturer, it may do so without coverage under this Agreement;
- f) Employees engaged in laboratory or specialty testing or inspections whether on or off-site.
- g) Employees engaged in geophysical testing (whether land or water) other than boring for core samples;
- h) Employees engaged in ancillary Project work performed by third parties such as electric utilities, gas utilities, telephone companies, and railroads.

SECTION 3 - NON-APPLICATION TO CERTAIN ENTITIES

This Agreement shall not apply to the parents, affiliates, subsidiaries, or other joint or sole ventures of any Contractors which do not perform work at this Project. It is agreed, for the purposes of this Agreement only, that this Agreement does not have the effect of creating any joint employment, single employer or alter ego status among the County and the Contractors. This Agreement shall further not apply to the County or any other state agency, authority, or other municipal or public entity and nothing contained herein shall be construed to prohibit or restrict the County or its employees or any other state authority, agency or entity and its employees from performing on or off-site work related to the Project.

SECTION 4 - COUNTY LIABILITY

The County shall not be liable, directly or indirectly, to any party for any act or omission of the Contractor, any other contractors or subcontractors, the Council or Local Unions, including but not limited to, any violation or breach of this Agreement by any of the aforementioned.

ARTICLE 4 - UNION RECOGNITION AND EMPLOYMENT

SECTION 1 - PRE-HIRE RECOGNITION

The Contractors recognize the Local Unions as the sole and exclusive bargaining representatives of all trade employees who are performing On-Site Project Work within the scope of this Agreement as defined in Article 3.

SECTION 2 - UNION'S REFERRAL

- A. The Contractors agree to hire trade employees covered by this Agreement through the job referral system and hiring halls (where the referrals meet the qualifications set forth in items 1, 2 and 4 of subparagraph B below) established in the collective bargaining agreements of the applicable Local Unions listed in Schedule A. Notwithstanding this, the Contractors shall have the sole right to determine the competency of all referrals; the number of employees required; the selection of employees to be laid off (except as provided in Article 5, Section 3); and to reject any applicant referred by a Local Union, subject to the show-up payments required in the applicable Local Union's collective bargaining agreement. In the event that a Local Union is unable to fill any request for qualified employees within a 48 hour period after such requisition is made by the Contractor (Saturdays, Sundays and Holidays excepted), the Contractor may employ qualified applicants from any other available source. In the event that the Local Union does not have a job referral system, the Contractor shall give the Local Union first preference to refer applicants, subject to the other provisions of this Article. The Contractor shall notify the applicable Local Union of trade employees hired within its jurisdiction from any source other than referral by the Local Union.
- B. A Contractor may request by name, and the Local Union will honor, referral of persons who have applied to the Local Union for On-Site Project Work and who meet the following qualifications as determined by a committee of 3 persons (the "Committee") designated, respectively, by the applicable Local Union, the Contractor and a mutually selected third party or, in the absence of agreement, the permanent arbitrator (or designee) designated in Article 7:
1. possess licenses required by New York State law for the On-Site Project Work to be performed by that individual;
 2. have worked a total of at least 1000 hours in the applicable construction trade during the prior 3 years;

3. were on the Contractor's active payroll for at least 60 out of the 180 calendar days prior to the contract award;
 4. have demonstrated ability to safely perform the basic functions of the applicable trade.
- C. No more than 12 per centum of the employees covered by this Agreement, per Contractor by trade, shall be hired through the special provisions above (any fraction shall be rounded to the next highest whole number).
- D. The Committee may also allow a Contractor, subject to the above per centum, to employ apprentice equivalents to afford an opportunity to minority, women or economically disadvantaged persons for entry into the construction industry outside of the formal apprenticeship program.

SECTION 3 - NON-DISCRIMINATION IN REFERRALS

The Local Unions represent that their hiring halls and referral systems will be operated in a non-discriminatory manner and in full compliance with all applicable federal, state and local laws and regulations which require equal employment opportunities. Referrals shall not be affected in any way by the rules, regulations, bylaws, constitutional provisions or any other aspects or obligations of union membership, policies or requirements and shall be subject to such other conditions as are established in this Article. No employment applicant shall be discriminated against by any referral system or hiring hall because of the applicant's union membership, or lack thereof.

SECTION 4 - MINORITY AND FEMALE REFERRALS

In the event a Local Union either fails, or is unable, to refer qualified minority or female applicants in percentages equaling Project affirmative action goals as set forth in the County's Project specifications, the Contractor may employ qualified minority or female applicants from any other available source.

SECTION 5 - CROSS AND QUALIFIED REFERRALS

The Local Union shall not knowingly refer to a Contractor an employee then employed by another Contractor working under this Agreement. The Local Unions will exert their utmost efforts to recruit sufficient numbers of skilled and qualified trade employees to fulfill the requirements of the Contractor.

SECTION 6 - UNION DUES

All employees covered by this Agreement shall be subject to the union security provisions contained in the applicable Local Unions' collective bargaining agreements as amended from time to time, but only for the period of time during which they are performing On-Site Project Work and only to the extent of rendering payment of the applicable monthly union dues uniformly required for union membership in the applicable Local Union which represents the trade in which the employee is performing On-Site Project Work. No employee shall be discriminated against at the Project site because of the employee's union membership or lack thereof. In the case of unaffiliated employees, the dues payment will be received by the Local Unions as an agency shop fee.

SECTION 7 - TRADE FOREPERSONS AND GENERAL FOREPERSONS

- A. The selection of trade forepersons and/or general forepersons and the number of forepersons required shall be solely the responsibility of the Contractor except where otherwise provided by specific provisions of an applicable Local Union's collective bargaining agreement. All forepersons shall take orders exclusively from the designated Contractor representatives. Trade forepersons shall be designated as working forepersons at the request of the Contractor, except when an existing Local Union's collective bargaining agreement prohibits a foreperson from working when the tradepersons he is leading exceed a specified number.
- B. There will be no non-productive employees of any title on the Project.

ARTICLE 5 - UNION REPRESENTATION

SECTION 1 - LOCAL UNION REPRESENTATIVE

Each Local Union representing employees who perform On-Site Project Work shall be entitled to designate in writing (copy to Contractor) one representative, and/or the Business Manager, who shall be afforded access to the Project. The Contractor shall provide a copy of such notification to each of its subcontractors.

SECTION 2 - STEWARDS

- A. Each Local Union shall have the right to designate a working journeyman as a Steward and an alternate, and shall notify the Contractor of the identity of the designated Steward (and alternate) prior to the assumption of such duties. Stewards shall not exercise supervisory functions and will

receive the regular rate of pay for their trade classifications. There will be no non-working Stewards on the Project.

- B. In addition to their work as employees, Stewards shall have the right to receive complaints or grievances and to discuss and assist in their adjustment with the Contractor's appropriate supervisor. Each Steward shall be concerned with the employees of the Steward's Contractor, and, if applicable, subcontractors of the Contractor, but not with the employees of any other contractor. The Contractor will not discriminate against the Steward in the proper performance of Union duties.
- C. The Stewards shall not have the right to determine when overtime shall be worked, or who shall work overtime except pursuant to a provision in a Local Union's collective bargaining agreement providing procedures for the equitable distribution of overtime.

SECTION 3 - LAYOFF OF A STEWARD

Contractors agree to notify the appropriate Union 24 hours prior to the layoff of a Steward, except in cases of discipline or discharge for just cause. If a Steward is protected against layoff by a Local Union's collective bargaining agreement, such provisions shall be recognized to the extent the Steward possesses the necessary qualifications to perform the work required. In any case in which a Steward is discharged or disciplined for just cause, the Local Union involved shall be notified immediately by the Contractor.

ARTICLE 6 - MANAGEMENT'S RIGHTS

SECTION 1 - RESERVATION OF RIGHTS

Except as expressly limited by a specific provision of this Agreement, the Contractor retains full and exclusive authority for the management of the Project operations including, but not limited to: the right to direct the work force, including determination as to the number to be hired and the qualifications therefore; the promotion, transfer, and layoff of its employees; the discipline or discharge for just cause of its employees; the assignment and schedule of work; the promulgation of reasonable Project work rules; and, the requirement, timing and number of employees to be utilized for overtime work. No rules, customs, or practices which limit or restrict productivity or efficiency of the individual, as determined by the Contractor, and/or joint working efforts with other employees shall be permitted or observed.

SECTION 2 - MATERIALS, METHODS & EQUIPMENT

There shall be no limitation or restriction upon the Contractor's choice of materials, techniques, methods, technology or design, or, regardless of source or location, upon the use and installation of equipment, machinery, package units, pre-cast, pre-fabricated, pre-finished, or pre-assembled materials, tools or other labor-saving devices. Contractors may, without restriction, install or use materials, supplies or equipment regardless of their source. The on-site installation or application of such items shall be performed by the trade having jurisdiction over such work; provided, however, it is recognized that other personnel having special qualifications may participate, in a supervisory capacity, in the installation, check-off or testing of specialized or unusual equipment or facilities as designated by the Contractor. There shall be no restrictions as to work which is not On-Site Project Work.

ARTICLE 7 - WORK STOPPAGES AND LOCKOUTS

SECTION 1 - NO STRIKES - NO LOCKOUTS

There shall be no strikes, sympathy strikes, picketing, work stoppages, slowdowns, hand billing, demonstrations or other disruptive activity at the Project for any reason by any Local Union or employee against any Contractors or employer while performing On-Site Project Work. There shall be no other Local Union, or concerted or employee activity which disrupts or interferes with the operation of the Contractors or the County. Failure of any Local Union or employee to cross any picket line established by any union, signatory or non-signatory to this Agreement, or the picket or demonstration line of any other organization, at or in proximity to the On-Site Project Work shall be deemed a violation of this Article. There shall be no lockout at the Project by any Contractor. Contractors and Local Unions shall take all steps necessary to ensure compliance with this Section 1 and to ensure uninterrupted construction for the duration of this Agreement.

SECTION 2 - DISCHARGE FOR VIOLATION

Contractors may discharge any employee violating Section 1, above, and any such employee will not be eligible thereafter for referral under this Agreement for a period of 100 days.

SECTION 3 - NOTIFICATION

If the Contractor contends that any Local Union has violated this Article, it will notify the President of the Council advising of such fact, with copies of the notification to the Local Union. The President of the Council shall instruct, order and otherwise use its best efforts to cause the employees and/or the Local

Unions to immediately cease and desist from any violation of this Article. The Council, in complying with these obligations, shall not be liable for the unauthorized acts of a Local Union or its members.

SECTION 4 - EXPEDITED ARBITRATION

Any Contractor or Local Union alleging a violation of Section 1 of this Article may utilize the expedited procedure set forth below in lieu of, or in addition to, any actions at law or equity that may be brought.

- A. A party invoking this procedure shall notify the American Arbitration Association to appoint an Arbitrator under this expedited arbitration procedure. Copies of such notification will be simultaneously sent to the alleged violator and, if a Local Union is alleged to be in violation, its International Union, the Council, and the Contractor.
- B. Upon appointment in accordance with the rules and regulations of the American Arbitration Association for an expedited arbitration proceeding, the Arbitrator shall thereupon, after notice as to time and place to the Contractor, the Local Union involved, and the Council hold a hearing within 48 hours of receipt of the notice invoking the procedure if it is contended that the violation still exists. The hearing will not, however, be scheduled for less than 24 hours after the notice to the Council required by Section 3, above.
- C. All notices pursuant to this Article may be by telephone, telegraph, hand delivery, or fax, confirmed by overnight delivery, to the Arbitrator, Contractor, the involved Local Union and the Council. The hearing may be held on any day including Saturdays or Sundays. The hearing shall be completed in one session, which shall not exceed 8 hours duration (no more than 4 hours being allowed to either side to present their case, and conduct their cross examination) unless otherwise agreed. A failure of any Local Union or Contractor to attend the hearing shall not delay the hearing of evidence by those present or the issuance of an award by the Arbitrator.
- D. The sole issue at the hearing shall be whether a violation of Section 1, above, occurred. If a violation is found to have occurred, the Arbitrator shall issue a Cease and Desist Award restraining such violation and serve copies on the Contractor and the Local Union involved. The Arbitrator shall have no authority to consider any matter in justification, explanation or mitigation of such violation or to award damages, which issue is reserved solely for court proceedings, if any. The Award shall be issued in writing within 3 hours after the close of the hearing, and may be issued without an Opinion. If any involved party desires an Opinion, one shall be issued within 15 calendar days, but its issuance shall not delay compliance with, or enforcement of, the Award.

- E. An Award issued under this procedure may be enforced by any court of competent jurisdiction upon the filing of this Agreement, together with the Award. Notice of the filing of such enforcement proceedings shall be given to the Local Union or Contractor involved. In any court proceeding to obtain a temporary or preliminary order enforcing the Arbitrator's award as issued under this expedited procedure, the involved Local Union and Contractor waive their right to a hearing and agree that such proceedings may be ex parte, provided notice is given to opposing counsel. Such agreement does not waive any party's right to participate in a hearing for a final court order of enforcement or in any contempt proceeding.
- F. Any rights created by statute or law governing arbitration proceedings which are inconsistent with the procedure set forth in this Article, or which interfere with compliance thereto, are hereby waived by the Contractors and Local Unions to whom they accrue.
- G. The fees and expenses of the Arbitrator shall be equally divided between the involved Contractor and Local Union.

SECTION 5 - ARBITRATION OF DISCHARGES

Procedures contained in Article 9 shall not be applicable to any alleged violation of this Article, with the single exception that an employee discharged for violation of Section 1, above, may have recourse to the procedures of Article 9 to determine only if the employee did, in fact, violate the provisions of Section 1 of this Article; but not for the purpose of modifying the discipline imposed where a violation is found to have occurred.

ARTICLE 8 - LABOR MANAGEMENT COMMITTEE

SECTION 1 - SUBJECTS

The Project Labor Management Committee (the "Labor Management Committee") will meet on a regular basis to: 1) promote harmonious relations among the contractors and Unions; 2) enhance safety awareness, cost effectiveness and productivity of construction operations; 3) protect the public interests; 4) discuss matters relating to staffing and scheduling with safety and productivity as considerations; 5) review Affirmative Action and equal employment opportunity matters pertaining to the Project; and 6) discuss such other matters as may be desirable or necessary in furtherance of the expeditious completion of the Project.

SECTION 2 - COMPOSITION

The Labor Management Committee shall be composed of one designee each of the Council, the Contractors and the Local Unions involved in the issues being discussed. The Labor Management Committee may conduct business through mutually agreed sub-committees.

ARTICLE 9 - GRIEVANCE & ARBITRATION PROCEDURE

SECTION 1 - PROCEDURE FOR RESOLUTION OF GRIEVANCES

Any question, dispute or claim arising out of, or involving the interpretation or application of this Agreement (other than jurisdictional disputes or alleged violations of Article 7, Section 1) shall be considered a grievance and shall be resolved pursuant to the exclusive procedure described below; provided, in all cases, that the question, dispute or claim arose during the term of this Agreement.

Step 1:

- (a) When any employee covered by this Agreement feels aggrieved by a claimed violation of this Agreement, the employee shall, through the Local Union business representative or job steward give notice of the claimed violation to the work site representative of the involved Contractor. To be timely, such notice of the grievance must be given within 14 calendar days after the act, occurrence or event giving rise to the grievance. The business representative of the Local Union or the job steward and the work site representative of the involved Contractor shall meet and endeavor to adjust the matter within 14 calendar days after a timely notice has been given. If they fail to resolve the matter within the prescribed period, the grieving party, may, within 14 calendar days thereafter, pursue Step 2 of the grievance procedure by serving the involved Contractor with written copies of the grievance setting forth a description of the claimed violation, the date on which the grievance occurred, and the provisions of the Agreement alleged to have been violated. Grievances and disputes settled at Step 1 are non-precedential except as to the specific Local Union, employee and Contractor directly involved unless the settlement is accepted in writing by the Contractor as creating a precedent.
- (b) Should any Contractor or Local Union have a dispute (excepting jurisdictional disputes or alleged violations of Article 7, Section 1) with any other Contractor or Local Union and after conferring a settlement is not reached within 14 calendar days, the dispute shall be reduced to writing and proceed to Step 2 in the same manner as outlined in subparagraph (a) for the adjustment of employee grievances.

Step 2:

The Business Manager or designee of the involved Local Union, together with representatives of the Council and the involved Contractor, shall meet in Step 2 within 14 calendar days of service of the written grievance to arrive at a satisfactory settlement.

Step 3:

- (a) If the grievance shall have been submitted but not resolved in Step 2, any of the participating Step 2 entities may, within 21 calendar days after the initial Step 2 meeting, submit the grievance in writing (copies to other participants) to the American Arbitration Association. The Labor Arbitration Rules of the American Arbitration Association shall govern the appointment and conduct of the arbitration hearing, at which all Step 2 participants shall be parties. The decision of the Arbitrator shall be final and binding on the involved Contractor, Local Union and employees and the fees and expenses of such arbitration shall be borne equally by the involved Contractor and Local Union.
- (b) Failure of the grieving party to adhere to the time limits set forth in this Article shall render the grievance null and void. These time limits may be extended only by written consent of the Contractor and the involved Local Union at the particular step where the extension is agreed upon. The Arbitrator shall have authority to make decisions only on the issues presented to him and shall not have the authority to change, add to, delete or modify any provision of this Agreement.

SECTION 2 - LIMITATION AS TO RETROACTIVITY

No arbitration decision or award may provide retroactivity of any kind exceeding 60 calendar days prior to the date of service of the written grievance on the Contractor or Local Union.

ARTICLE 10 - JURISDICTIONAL DISPUTES

SECTION 1 - NO DISRUPTIONS

There will be no strikes, sympathy strikes, work stoppages, slowdowns, picketing or other disruptive activity of any kind arising out of any jurisdictional dispute. Pending the resolution of the dispute, the work shall continue uninterrupted and as assigned by the Contractor. No jurisdictional dispute shall excuse a violation of Article 7.

SECTION 2 - ASSIGNMENT

All On-Site Project Work assignments shall be made pursuant to law.

SECTION 3 - PROCEDURE FOR SETTLEMENT OF JURISDICTIONAL DISPUTES

- A. Any Local Union having a jurisdictional dispute with respect to On-Site Project Work assigned to another Local Union will submit the dispute in writing to the Administrator, Plan for the Settlement of Jurisdictional Disputes in the Construction Industry (“the Plan”) within 72 hours and send a copy of the letter to the Local Union and the International Union involved, the President of the Council, the County and the Contractor involved. Upon receipt of a dispute letter from any Local Union, the Administrator will invoke the procedures set forth in the Plan to resolve the jurisdictional dispute. The jurisdictional dispute letter shall contain the information described in Article IV of the Plan.
- B. Within 5 calendar days of receipt of the dispute letter, there shall be a meeting of the Contractor involved, the Local Unions involved and the President of the Council for the purpose of resolving the jurisdictional dispute.
- C. If the dispute remains unresolved after this meeting, the parties will proceed to final and binding arbitration in accordance with the principles and procedures set forth in the rules of the Plan.
- D. The Arbitrator will render a short-form decision within 5 days of the hearing based upon the evidence submitted at the hearing, with a full written decision to follow within 30 days of the close of the hearing.
- E. This Jurisdictional Dispute Resolution Procedure will only apply to On-Site Project Work performed by Local Unions. A representative of the County and the International Union involved may also attend the meeting.
- F. Any Local Union involved in a jurisdictional dispute on this Project shall continue working in accordance with Section 2 above and without disruption of any kind.
- G. Copies of the Plan will be provided by the Council upon request.

SECTION 4 - AWARD

Any jurisdictional award pursuant to Section 3 shall be final and binding on the disputing Local Unions and the involved Contractor on this Project only, and may be enforced in any court of competent

jurisdiction. Such award or resolution shall not establish a precedent on any other construction work not covered by this Agreement. In all disputes under this Article, the involved Contractors shall be considered parties in interest.

SECTION 5 - LIMITATIONS

The Jurisdictional Dispute Arbitrator shall have no authority to assign work to a double crew, that is, to more employees than the minimum required by the involved Contractor to perform the work involved; nor to assign the work to employees who are not qualified to perform work involved; nor to assign work being performed by non-union employees to union employees. This does not prohibit the establishment, with the agreement of the involved Contractor, of composite crews where more than one employee is needed for the job. The aforesaid determinations shall decide only to whom the disputed work belongs.

SECTION 6 - NO INTERFERENCE WITH WORK

There shall be no interference or interruption of any kind with the On-Site Project Work while any jurisdictional dispute is being resolved. The On-Site Project Work shall proceed as assigned by the involved Contractor until finally resolved under the applicable procedure of this Article. The award shall be confirmed in writing to the involved parties. There shall be no strike, work stoppage, or interruption in protest of any such award.

ARTICLE 11 - WAGES AND BENEFITS

SECTION 1 - CLASSIFICATION AND BASE HOURLY RATE

All employees covered by this Agreement shall be classified in accordance with the work performed and paid the base hourly wage rates for those classifications as specified in the applicable Local Unions' collective bargaining agreements, as they may be amended during the term of this Agreement. Recognizing, however, that special conditions may exist or occur on the Project, the parties, by mutual agreement may establish rates and/or hours for one or more classifications which may differ from the applicable collective bargaining agreements. Parties to such agreements shall be the Contractor involved, the involved Local Unions and the Council.

SECTION 2 - EMPLOYEE BENEFIT FUNDS

The Contractors agree to pay contributions on behalf of all employees covered by this Agreement to the established employee benefit funds in the amount designated in the appropriate Local Unions' collective bargaining agreements; provided, however, that the involved Contractors and the Local Unions agree that

only such bona fide employee benefits as are explicitly required under Section 220 of the New York State Labor Law shall be included in this requirement and paid by the Contractors on this Project. Bona fide jointly trustee fringe benefit plans established or negotiated through collective bargaining during the life of this Agreement may be added if similarly protected under Section 220. Contractors shall not be required to contribute to non-Section 220 benefits, trusts or plans.

The Contractors agree to be bound by the written terms of the legally-established Local Union collective bargaining agreement and/or Trust Agreements specifying the detailed basis on which payments are to be paid into, and benefits paid out of, such Trust Funds but only with regard to work done on this Project and only for those employees to whom this Agreement requires such benefit payments. Copies of such Trust Agreements will be provided by the Council upon request.

ARTICLE 12 - HOURS OF WORK, PREMIUM PAYMENTS, SHIFTS AND HOLIDAYS

SECTION 1 - WORK WEEK AND WORK DAY

- A. The standard work week shall consist of 40 hours of work at straight time rates per one of the following schedules:
 - i.) Five-Day Work Week: Monday-Friday; 5 days, 8 hours plus 1/2 hour unpaid lunch period each day.
 - ii.) Four-Day Work Week: Monday-Thursday; 4 days, 10 hours plus 1/2 hour unpaid lunch period each day.
- B. The day shift shall commence between the hours of 6:00 a.m. and 9:00 a.m. and shall end between the hours of 2:00 p.m. and 7:30 p.m. Starting and quitting times shall occur at the staging areas as may be designated by the Contractor.
- C. Scheduling – The Contractor shall have the option of scheduling either a five-day or four-day work week and the work day hours consistent with the Project requirements, the Project schedule and minimization of interference. When conditions beyond the control of the Contractor, such as severe weather, power failure, fire or natural disaster, prevent the performance of On-Site Project Work on a regularly scheduled work day, the Contractor may, with mutual agreement of the involved Local Unions on a trade-by-trade basis, schedule work on Friday (where on four 10s) or Saturday (where on five 8s) during that calendar week in which a work day was lost, at straight

time pay, provided that the employees involved work a total of 40 hours or less during that work week. When conditions on the Project cause the Contractor to stop work or be unable to commence work on the day in question, the Contractor will notify the Local Unions and the employees at that time that Friday or Saturday, as the case may be, will be a make-up day for the affected operation(s) and the Friday or Saturday work will then be at straight time for the day or any portion of the work day that work was stopped. The balance of the day on Friday or Saturday, if any, will be at time and one-half (1/2) the straight time rate of pay. If the Contractor seeks to cancel a day's work in advance of that day and to schedule the following Friday or Saturday as a make-up day, the determination of whether the Contractor is unable to perform the affected work operation(s) shall be jointly made between the Contractor and the involved Local Unions, the Local Unions' agreement not to be unreasonably withheld.

- D. Notice – Contractors shall provide not less than five (5) days prior notice to the Local Unions as to the work week and work hours scheduled to be worked or such lesser notice as may be mutually agreed upon.

SECTION 2 - OVERTIME

Overtime pay for hours outside of the standard work week and work day, described in Paragraph A above, shall be paid in accordance with the applicable Local Unions' collective bargaining agreements. There will be no restriction upon the Contractor's scheduling of overtime or the non-discriminatory designation of employees who work. There shall be no pyramiding of overtime pay under any circumstances. The Contractor shall have the right to schedule work so as to minimize overtime.

SECTION 3 - SHIFTS

- A. Flexible Schedules - Scheduling of shift work shall remain flexible in order to meet Project schedules and existing Project conditions including the minimization of interference with traffic. It is not necessary to work a day shift in order to schedule a second shift. Shifts must be worked a minimum of five consecutive work days, must have prior approval of the Contractor and/or subcontractor, and must be scheduled with not less than five work days notice to the Local Union.
- B. Second Shift - The second shift (starting between 2 p.m. and 8 p.m.) shall consist of 8 hours work (or 10 hours of work) for an equal number of hours pay at the straight time rate plus 15% in lieu of overtime and exclusive of a 1/2 hour unpaid lunch period. Where specifically required by the applicable Local Unions' collective bargaining agreements, employees on second shift, where there are no first shift employees scheduled for that trade, will be paid at time and one-half rates

for such second shift work, but without any shift differential. In all other cases, the first sentence of this paragraph B shall apply.

- C. Flexible Starting Times - Shift starting times will be adjusted by the Contractor as necessary to fulfill Project requirements subject to the notice requirements of Paragraph A.
- D. Four Tens - When working a four-day work week, the standard work day shall consist of 10 hours work for 10 hours of pay at the straight time rate exclusive of an unpaid 1/2 hour meal period and regardless of the starting time. This provision is applicable to night shifts only, and such night shifts are subject to the shift differential in paragraph B above.

SECTION 4 - HOLIDAYS

- A. Schedule - There shall be eight (8) recognized holidays on the Project:

New Year's Day	Labor Day
President's Day	Veterans Day
Memorial Day	Thanksgiving Day
Fourth of July	Christmas Day

All said holidays shall be observed on the dates designated by New York State law. In the absence of such designation, they shall be observed on the calendar date except those holidays which occur on Sunday shall be observed on the following Monday.

- B. Payment - Regular holiday pay, if any, and/or premium pay for work performed on such a recognized holiday shall be in accordance with the applicable Local Unions' collective bargaining agreements.
- C. Exclusivity - No holidays other than those listed in paragraph A above shall be recognized nor observed.

SECTION 5 - REPORTING PAY

- A. Employees who report to the work location pursuant to regular schedule and who are not provided with work or whose work is terminated early by a Contractor, for whatever reason, shall receive minimum reporting pay in accordance with the applicable Local Unions' collective bargaining agreements.
- B. When an employee, who has completed his/her scheduled shift and left the Project site, is "called out" to perform special work of a casual, incidental or irregular nature, the employee shall receive

pay for actual hours worked with a minimum guarantee, as may be required by the applicable Local Union's collective bargaining agreement, at the employee's straight time rate.

- C. When an employee leaves the job or work location of his/her own volition or is discharged for cause or is not working as a result of the Contractor's invocation of Section 7 below, he/she shall be paid only for the actual time worked.
- D. Except as specifically set forth in this Article, there shall be no premiums, bonuses, hazardous duty, high time or other special payment of any kind.
- E. There shall be no pay for time not actually worked except as specifically set forth in this Article and except where an applicable Local Union's collective bargaining agreement requires a full week's pay for forepersons.

SECTION 6 - PAYMENT OF WAGES

- A. Payday - Payment shall be made by check, drawn on a New York bank with branches located within commuting distance of the job site. Paychecks shall be issued by a Contractor at the job site by 10 a.m. on Thursdays. In the event that the following Friday is a bank holiday, paychecks shall be issued on Wednesday of that week. Not more than 3 days wages shall be held back in any pay period. Paycheck stubs shall contain the name and business address of the Contractor, together with an itemization of deductions from gross wages.
- B. Termination - Employees who are laid off or discharged for cause shall be paid in full for that which is due them at the time of termination. The Contractor shall also provide the employee with a written statement setting forth the date of lay off or discharge.

SECTION 7 - EMERGENCY WORK SUSPENSION

A Contractor may, if considered necessary for the protection of life and/or safety of employees or others, suspend all or a portion of On-Site Project Work. In such instances, employees will be paid for actual time worked; provided, however, that when a Contractor requests that employees remain at the job site available for work, employees will be paid for "stand by" time at their hourly rate of pay.

SECTION 8 - INJURY-DISABILITY

An employee who, after commencing work, suffers a work-related injury or disability while performing work duties, shall receive no less than 8 hours wages for that day. Further, the employee shall be rehired

at such time as able to return to duties provided there is still work available on the Project for which the employee is qualified and able to perform.

SECTION 9 - TIME KEEPING

A Contractor may utilize brassing or other systems to check employees in and out. Each employee must check in and out. The Contractor will provide adequate facilities for checking in and out in an expeditious manner.

SECTION 10 - MEAL PERIOD

A Contractor shall schedule an unpaid period of not more than 1/2 hour duration at the work location between the 3rd and 5th hour of the scheduled shift. A Contractor may, for efficiency of operation, establish a schedule which coordinates the meal periods of two or more trades. If an employee is required to work through the meal period, the employee shall be compensated in a manner established in the applicable Local Union's collective bargaining agreement.

SECTION 11 - BREAK PERIODS

There will be no rest periods, organized coffee breaks or other non-working time established during working hours. Individual coffee containers will be permitted at the employee's work location.

ARTICLE 13 - APPRENTICES

SECTION 1 - RATIOS

Recognizing the need to maintain continuing supportive programs designed to develop adequate numbers of competent workers in the construction industry and to provide trade entry opportunities for minorities and women, Contractors will employ apprentices in their respective trades to perform such work as is within their capabilities and which is customarily performed by the trade in which they are indentured. Contractors may utilize apprentices and such other appropriate classifications as are contained in the applicable Local Union's collective bargaining agreement in a ratio not to exceed 25% of the work force by trade (without regard to whether a lesser ratio is set forth in the applicable Local Union's collective bargaining agreement), unless the applicable Local Union's collective bargaining agreement provides for a higher percentage. Apprentices and such other classifications as are appropriate shall be employed in a manner consistent with the provisions of the appropriate Local Union's collective bargaining agreement.

SECTION 2 - DEPARTMENT OF LABOR

To assist the Contractors in attaining a maximum effort on this Project, the Local Unions agree to work in close cooperation with, and accept monitoring by, the New York State Department of Labor and the County to ensure that minorities and women are afforded every opportunity to participate in apprenticeship programs which result in the placement of apprentices on this Project. To further ensure that this contractor effort is attained, up to 50% of the apprentices placed on this Project shall be first year minority or women apprentices as shall be 60% of the apprentice equivalents, placed on the Project, who do not necessarily meet all of the age or entrance requirements for the apprentice program or have not necessarily passed the entrance examination. The Local Unions will cooperate with the contractor requests for minority, women or economically disadvantaged referrals to meet this contractor effort.

ARTICLE 14 - SAFETY PROTECTION OF PERSON AND PROPERTY

SECTION 1 - SAFETY REQUIREMENTS

Each Contractor will ensure that applicable OSHA requirements are at all times maintained on the Project and the employees and the Local Unions agree to cooperate fully with these efforts. Employees must perform their work at all times in a safe manner and protect themselves and the property of the Contractors and the County from injury or harm. Failure to do so will be grounds for discipline, including discharge.

SECTION 2 - CONTRACTOR RULES

Employees covered by this Agreement shall at all times be bound by the reasonable safety, security, and visitor rules as established by the Contractors for this Project. Such rules will be published and posted in conspicuous places throughout the Project.

SECTION 3 - INSPECTIONS

The Contractors retain the right to inspect incoming shipments of equipment, apparatus, machinery and construction materials of every kind.

ARTICLE 15 - NO DISCRIMINATION

SECTION 1 - COOPERATIVE EFFORTS

The Contractors and the Local Unions agree that they will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, national origin, age or

marital status in any manner prohibited by law or regulation. It is recognized that special procedures may be established by the Contractors, the Local Unions and the New York State Department of Labor for the training and employment of persons who have not previously qualified to be employed on construction projects of the type covered by this Agreement. The parties to this Agreement will assist in such programs and agree to use their best efforts to ensure that the goals for female and minority employment are met on this Project.

SECTION 2 - LANGUAGE OF AGREEMENT

The use of the masculine or feminine gender in this Agreement shall be construed as including both genders.

ARTICLE 16 - GENERAL TERMS

SECTION 1 - PROJECT RULES

The Contractors shall establish such reasonable Project rules as are appropriate for the good order of the Project. These rules will be explained at the pre-job conference and posted at the Project site and may be amended thereafter as necessary. Failure of an employee to observe these rules and regulations shall be grounds for discipline, including discharge. The fact that no order was posted prohibiting a certain type of misconduct shall not be a defense to an employee disciplined or discharged for such misconduct when the action taken is for cause.

SECTION 2 - TOOLS OF THE TRADE

The welding/cutting torch and chain fall are tools of the trade having jurisdiction over the work performed. Employees using these tools shall perform any of the work of the trade. There shall be no restrictions on the emergency use of any tools or equipment by any qualified employee or on the use of any tools or equipment for the performance of work within the employee's jurisdictions.

SECTION 3 - SUPERVISION

Employees shall work under the supervision of the trade foreperson or general foreperson.

SECTION 4 - TRAVEL ALLOWANCES

There shall be no payments for travel expenses, travel time, subsistence allowance or other such reimbursements or special pay except as expressly set forth in this Agreement.

SECTION 5 - FULL WORK DAY

Employees shall be at their staging area at the starting time established by the Contractor and shall be returned to their staging area by quitting time after performing their assigned functions under the supervision of the Contractor. The signatories reaffirm their policy of a fair day's work for a fair day's wage.

SECTION 6 - COOPERATION

The Contractor and the Local Unions will cooperate in seeking any New York State Department of Labor approvals that may be required for implementation of any terms of this Agreement.

ARTICLE 17 - SAVINGS AND SEPARABILITY

SECTION 1 - THIS AGREEMENT

In the event that the application of any provision of this Agreement is enjoined, on either an interlocutory or permanent basis, or otherwise found in violation of law, the provision involved shall be rendered, temporarily or permanently, null and void but the remainder of the Agreement shall remain in full force and effect. In such event, the Agreement shall remain in effect for contracts already bid and awarded or in construction where the Contractor voluntarily accepts the Agreement. The parties to this Agreement will enter into negotiations for a substitute provision in conformity with the law and the intent of the parties for contracts to be let in the future.

SECTION 2 - THE BID SPECIFICATIONS

In the event that the County bid specifications, or other action, requiring that a successful bidder become signatory to this Agreement is enjoined, on either an interlocutory or permanent basis, or otherwise found in violation of law such requirement shall be rendered, temporarily or permanently, null and void but the Agreement shall remain in full force and effect to the extent allowed by law. In such event, the Agreement shall remain in effect for contracts already bid and awarded or in construction where the Contractor voluntarily accepts the Agreement. The parties will enter into negotiations as to modifications to the Agreement to reflect the court action taken and the intent of the parties for contracts to be let in the future.

SECTION 3 - NON-LIABILITY

In the event of an occurrence referenced in Section 1 or Section 2 of this Article, neither the County, the Contractors, or any Local Union shall be liable, directly or indirectly, for any action taken, or not taken, to

comply with any court order, injunction or determination. Project bid specifications will be issued in conformance with court orders then in effect and no retroactive payments or other action will be required if the original court determination is ultimately reversed.

SECTION 4 - NON-WAIVER

Nothing in this Article shall be construed as waiving the prohibitions of Article 7 as to Contractors and Local Unions.

ARTICLE 18 - FUTURE CHANGES IN SCHEDULE "A" COLLECTIVE BARGAINING AGREEMENTS

SECTION 1 - CHANGES TO COLLECTIVE BARGAINING AGREEMENTS

- A. The Contractors and/or Local Unions who are parties to the collective bargaining agreements which are applicable to the On-Site Project Work shall notify the Contractor in writing of any mutually agreed upon changes in provisions of such agreements and the effective dates of such changes.
- B. It is agreed that any provisions negotiated into collective bargaining agreements will not apply to On-Site Project Work if such provisions are less favorable to this Project than those uniformly required of contractors for construction work normally covered by those agreements; nor shall any provision be recognized or applied on this Project if it may be construed to apply exclusively, or predominantly, to work covered by this Agreement.
- C. Any disagreement between signatories to this Agreement over the application to On-Site Project Work of provisions agreed upon in the renegotiation of collective bargaining agreements shall be resolved in accordance with the procedure set forth in Article 9 of this Agreement.

SECTION 2 - LABOR DISPUTES DURING COLLECTIVE BARGAINING AGREEMENT NEGOTIATIONS

The Local Unions agree that there will be no strikes, work stoppages, sympathy actions, picketing, slowdowns or other disruptive activity or other violations of Article 7 affecting the Project by any Local Union involved in the renegotiation of collective bargaining agreements nor shall there be any lock-out on this Project affecting a Local Union during the course of such renegotiations.

ARTICLE 19 – WORKERS’ COMPENSATION ADR

All Local Unions, the Contractor and its subcontractors performing On-Site Project Work agree to adopt and be bound by the Alternative Dispute Resolution Agreement entered into between the Construction Industry Council of Westchester and Hudson Valley, Inc. and the Council (herein after referred to as the “Workers’ Compensation ADR Agreement”).

The Contractor and its subcontractors may provide Workers’ Compensation insurance through an alternative insurance carrier (or through self-insurance) or may use an alternative Program Manager, other than the primary carrier or Program Manager designated in Article III, Section 2 of the Workers’ Compensation ADR Agreement. The use of an alternative carrier (or self-insurance) and/or Program Manager is subject to approval by the Workers’ Compensation ADR Agreement Oversight Committee, which approval shall not be unreasonably withheld.

The determination to utilize the Workers’ Compensation ADR Agreement will be at the exclusive option of the County.

SIGNATURES

IN WITNESS WHEREOF the parties have caused this Agreement to be executed and effective as the ____ day of _____, 20__.

**BUILDING AND CONSTRUCTION TRADES COUNCIL OF
WESTCHESTER AND PUTNAM COUNTIES, NEW YORK, AFL-CIO
on behalf of itself and its affiliated Local Unions.**

BY: _____
PRESIDENT

DATE: _____

BY: _____
VICE-PRESIDENT

DATE: _____

BY: _____
SECRETARY-TREASURER

DATE: _____

{INSERT NAME OF CONTRACTOR}

BY: _____
(Name & Title)

DATE: _____

**APPROVED BY:
COUNTY OF WESTCHESTER**

BY: _____
Commissioner of Public Works and Transportation

DATE: _____

Approved as to form:

Sr. Assistant County Attorney
County of Westchester

SCHEDULE "A"

LOCAL COLLECTIVE BARGAINING AGREEMENTS

Below is a list of the affiliate Local Unions of the Building and Construction Trades Council of Westchester and Putnam Counties, New York, AFL-CIO ("Council"). Copies of the applicable Collective Bargaining Agreements of the Local Unions can be obtained by writing to the Building and Construction Trades Council Westchester and Putnam Counties, New York AFL-CIO at 258 Saw Mill River Road, Elmsford, New York 10523, Attn: Edward Doyle, President.

1. Asbestos Workers Local #91 (International Association of Heat and Frost Insulators and Asbestos Workers).
2. Boilermakers Local #5
3. Bricklayers and Allied Craftworkers Local #5 New York
4. Bridge Painters Local 806
5. Dockbuilders Local Union 1456
6. Empire State Regional Council of Carpenters, Reg. 2, Local 11
7. Glaziers Local 1281
8. International Association of Bridge and Structural Ironworkers Local Union 40
9. International Brotherhood of Electrical Workers Local Union 363
10. International Brotherhood of Painters & Allied Trades District Council 9 of New York
11. International Union of Operating Engineers Local 15, 15A, 15B, 15C and 15D
12. International Union of Operating Engineers Local Unions No. 137, 137A, 137B, 137C, 137R
13. Iron Workers District Council of Greater New York and Vicinity
14. IUOE Local No. 30 – Operating Engineers
15. Laborers' International Union of N.A. Local 235 of Westchester and Putnam Counties, New York AFL-CIO
16. Local One International Union of Elevator Constructors of New York and New Jersey – (AFL-CIO)
17. Local Union #3 International Brotherhood of Electrical Workers
18. Metal Polishers Local 8A-28A
19. Metallic Lathers Local No. 46
20. Millwright and Machinery Erectors Local Union No. 740
21. Operative Plasterers' and Cement Masons' International Association Local 530
22. Ornamental Ironworkers Local Union No. 580
23. Plumbers and Steamfitters Local 21
24. Resilient Floor Coverers Local No. 2287

25. Road Sprinkler Fitters Local 669
26. Sheet Metal Workers' International Association Local 137
27. Sheet Metal Workers' Local Union 38
28. Stone Derrickmen and Riggers Local Union No. 197
29. Teamsters Local 813 (Waste Removal)
30. Teamsters Local No. 814 (Moving & Storage)
31. Teamsters Local Union No. 456 (Construction)
32. Tile, Marble & Terrazzo Bricklayers & Allied Craftsmen Local Union No. 7 of New York & New Jersey
33. United Cement Masons' Union of Greater New York and Long Island Local 780
34. United Union of Roofers, Waterproofers and Allied Workers, Local No. 8, New York
35. Westchester Putnam Counties Heavy and Highway Laborers' Local No. 60 L.I.U.N.A.

Not all Local Unions will necessarily be involved in the Project. If it is determined that additional affiliates of the Council are required to be engaged in Project construction work, then the PLA will include those additional affiliates.



George Latimer, Westchester County Executive

**General Requirements and Proposals
Information for Bidders
General and Special Clauses
Technical Specifications**

TITLE

**INFRASTRUCTURE REHABILITATION – PHASE 3
PLAYLAND PARK
RYE, NEW YORK**

VOLUME 2

**Contract No. 22-523
Bid Opening: October 5, 2022**

By Bidder (Please Print)	For Official Use Only
Firm/Business Name: _____ Address: _____ _____	_____ _____

**DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION
Division of Engineering**

TABLE OF CONTENTS

DIVISION 1 – GENERAL CONDITIONS

01 00 00	Special Requirements
01 20 00	Price and Payment Procedures
01 30 00	Administrative Requirements
01 32 16	Construction Progress Schedule
01 32 33	Pre-Construction Building Survey
01 35 26	Health and Safety Requirements
01 45 00	Quality Control
01 50 00	Temporary Facilities and Controls
01 52 14	Engineer's Field Office
01 52 15	Contractor's Field Facilities
01 65 00	Product Delivery, Storage, and Handling
01 70 00	Execution and Closeout
01 74 19	Construction Waste Management and Disposal
01 78 23	Operations and Maintenance Data
01 78 36	Warranties
01 78 39	Project Record Documents

DIVISION 2 – EXISTING CONDITIONS

02 01 00	Maintenance of Existing Conditions
02 41 16	Structure Demolition
02 41 19	Selective Demolition
02 82 00	Asbestos Removal
02 83 33.13	Removal and Disposal of Lead-Containing Paint

DIVISION 3 - CONCRETE

03 05 51	Concrete Bonding Agents
03 05 55	Concrete Admixtures and Additives
03 11 13	Structural Cast-in-Place Concrete Forming
03 15 00	Concrete Accessories
03 30 00	Concrete and Reinforcing Steel
03 39 00	Concrete Curing
03 49 00	Glass Fiber Reinforced Concrete (GFRC)
03 60 00	Grout

DIVISION 5 - METAL

05 12 00	Structural Steel Framing
05 31 00	Steel Deck
05 40 00	Cold Formed Metal Framing
05 50 00	Metal Fabrications and Anchorage

CONTRACT No. 22-523
TECHNICAL SPECIFICATIONS – TABLE OF CONTENTS

DIVISION 6 – WOOD, PLASTICS, AND COMPOSITES

06 10 00	Rough Carpentry
06 10 53	Wood Nailers and Blocking
06 13 23	Heavy Timber Construction
06 18 00	Timber Construction
06 21 00	Glued Laminated Construction
06 40 13	Exterior Architectural Woodwork
06 64 00	Fiberglass Reinforced Plastic Panels

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

07 01 50.22	Preparation for Reroofing
07 21 00	Thermal Insulation
07 31 13	Asphalt Shingles
07 46 23	Wood Siding Assemblies
07 52 16	SBS Modified Bituminous Membrane Roofing
07 62 00	Sheet Metal Flashing
07 71 00	Roof Specialties and Accessories
07 84 13	Penetration Firestopping
07 84 43	Joint Firestopping
07 92 00	Joint Sealants

DIVISION 8 - OPENINGS

08 11 13	Hollow Metal Doors and Frames
08 14 33	Stile and Rail Wood Doors
08 31 13	Access Doors and Frames
08 33 00	Overhead Bi-Fold Doors
08 33 13	Coiling Counter Doors (Non-Fire Rated & Fire Rated)
08 33 23	Overhead Coiling Doors (Non-Fire Rated & Fire Rated)
08 51 13	Aluminum Windows
08 54 13	Fiberglass Windows
08 62 10	Steel Sash Window Restoration
08 71 00	Door Hardware
08 80 00	Glass and Glazing

DIVISION 9 - FINISHES

09 24 00	Cement Plastering
09 29 00	Gypsum Drywall
09 30 13	Ceramic Tiling
09 67 23	Resinous Flooring
09 91 00	Painting and Finishing

CONTRACT No. 22-523
TECHNICAL SPECIFICATIONS – TABLE OF CONTENTS

DIVISION 10 - SPECIALTIES

10 14 23.16	Room-Identification Panel Signage
10 28 00	Toilet Accessories
10 44 16	Fire Extinguishers
10 60 00	Polycarbonate Roofing Glazing System
10 75 00	Flagpoles
10 81 13	Bird Control Netting

DIVISION 12 – FURNISHINGS AND ACCESSORIES⁵⁷

12 11 00	Mural Art
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DIVISION 21 – FIRE SUPPRESSION

21 05 17	Sleeves And Sleeve Seals for Fire Suppression Piping
21 05 18	Escutcheons For Fire Suppression Piping
21 05 23	General Duty Valves for Water Based Fire Suppression Piping
21 05 29	Hangers And Supports for Fire Suppression Piping and Equipment
21 05 48	Vibration And Seismic Control for Fire Suppression Piping and Equipment
21 05 53	Identification For Fire Suppression Piping and Equipment
21 11 00	Facility Fire-Suppression Water-Service Piping
21 11 19	Fire Department Connections
21 13 13	Wet-Pipe Sprinkler Systems
21 13 16	Dry-Pipe Sprinkler Systems

DIVISION 22 – PLUMBING

22 05 17	Sleeves and Sleeve Seals for Plumbing Piping
22 05 18	Escutcheons for Plumbing Piping
22 05 23.12	Ball Valves for Plumbing Piping
22 05 23.15	Gate Valves for Plumbing Piping
22 05 29	Hangers and Supports for Plumbing Piping and Equipment
22 05 53	Identification for Plumbing Piping and Equipment
22 07 19	Plumbing Piping Insulation
22 11 13	Facility Water Distribution Piping
22 11 16	Domestic Water Piping
22 11 19	Domestic Water Piping Specialties
22 13 13	Facility Sanitary Sewers
22 13 16	Sanitary Waste and Vent Piping
22 13 19	Sanitary Waste Piping Specialties
22 13 19.13	Sanitary Drains
22 13 29	Sanitary Sewerage Pumps
22 15 13	General-Service Compressed-Air Piping
22 15 19	General-Service Packaged Air Compressors and Receivers
22 33 00	Electric, Domestic-Water-Heaters

CONTRACT No. 22-523
TECHNICAL SPECIFICATIONS – TABLE OF CONTENTS

22 42 13.13	Commercial Water Closets
22 42 16.13	Commercial Lavatories
22 42 16.16	Commercial Sinks

DIVISION 23 – MECHANICAL

23 05 00	Common Work Results for HVAC
23 05 13	Common Motor Requirements for HVAC Equipment
23 05 17	Sleeves and Sleeve Seals for HVAC Piping
23 05 29	Hangers and Supports for HVAC Piping and Equipment
23 05 48	Vibration and Seismic Controls for HVAC
23 05 53	Identification for HVAC Piping and Equipment
23 05 93	Testing, Adjusting, and Balancing for HVAC
23 07 00	HVAC Insulation
23 09 00	Instrumentation and Control for HVAC
23 23 00	Refrigerant Piping
23 31 13	Metal Ducts
23 33 00	Air Duct Accessories
23 34 00	HVAC Fans
23 34 10	HVAC Ceiling Fans
23 37 00	Air Outlets and Inlets
23 74 00	Packaged Outdoor Rooftop Air Handling Units
23 82 00	Terminal Heating and Cooling Units

DIVISION 26 - ELECTRICAL

26 01 26	Testing
26 05 01	Electrical General Provision
26 05 05	Demolition Electrical
26 05 19	Wires and Cables (600V Maximum)
26 05 21	Labeling and Identification
26 05 26	Grounding System
26 05 29	Hangers and Supports
26 05 33	Electrical Raceway Systems
26 18 13	Fuses
26 22 13	Low Voltage Distribution Transformers
26 24 16	Panelboards
26 27 26	Wiring Devices
26 28 23	Low Voltage Electric Control Equipment and Devices
26 30 00	Electric Motors
26 41 13	Lightning Protection for Structures
26 51 00	Lighting System

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

28 46 21.11	Addressable Fire-Alarm Systems
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CONTRACT No. 22-523
TECHNICAL SPECIFICATIONS – TABLE OF CONTENTS

DIVISION 31 - EARTHWORK

31 00 00	Earthwork
31 10 00	Site Clearing
31 19 13	Geotechnical Instrumentation and Monitoring
31 22 13	Rough Grading
31 23 16	Excavation
31 23 19	Dewatering
31 23 23.13	Backfill
31 23 24	Compaction
31 23 33	Trenching
31 41 00	Excavation Protection System
31 62 15	Drilled Micropiles (with App A - Historical Boring Information)

DIVISION 32 – EXTERIOR IMPROVEMENTS

32 12 16	Asphalt Paving
32 33 00	Site Furnishings

DIVISION 33 – UTILITIES

33 41 00	Storm Utility Drainage Piping
33 44 13.13	Precast Concrete Catch Basins and Field Inlets
33 44 16	Trench Drain
33 49 13.13	Storm Drainage and Sewer Manholes
33 71 19	Electrical Underground Ducts and Manholes

TECHNICAL SPECIFICATIONS

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION
Division of Engineering

SECTION 01 32 33 – PRE-CONSTRUCTION BUILDING SURVEY

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Building Survey Documentation
 - 2. Photographic Documentation of Existing Conditions & Construction Progress

1.2 SUBMITTALS

- A. Building Survey:
 - 1. Contractor shall submit an electronic and hard copy, DWG and PDF files of the pre-construction survey drawings for the following structures:
 - a. Cross Axis Building A
 - b. Cross Axis Building D
 - c. Cross Axis Building E
 - d. Cross Axis Building F
 - e. Dragon Coaster Vendors
 - f. Restaurant Kitchen with Food Vending
 - g. Southeast Arcade
 - h. Northeast Burger Barn
- B. Photographs
 - 1. Photographs shall be provided for the following structures:
 - a. Cross Axis Building A
 - b. Cross Axis Building D
 - c. Cross Axis Building E
 - d. Cross Axis Building F
 - e. Dragon Coaster Vendors
 - f. Restaurant Kitchen with Food Vending
 - g. Southeast Arcade
 - h. Northeast Burger Barn
 - 2. A full-color proof sheet including each photograph taken shall be submitted within seven (7) days of the date the photographs were taken.
 - 3. Each photograph shall be clear and focused and of sufficient resolution to discern details as may be required by the Engineer. Photographs which do not develop properly, are over or under exposed, or which were not ordered by the Engineer, shall be unacceptable and will not be counted against the number of photographs required. The Engineer will be the sole judge of acceptability.
 - 4. Compact discs (CD) containing high-resolution digital copies of each acceptable photograph. Each CD shall contain an index file listing the file name of each photograph and the description, date, and time of the photograph and the name of the photographer. The CDs shall be submitted within fifteen (15) days of the date the photograph was taken.

1.3 QUALITY ASSURANCE

- A. The surveyor engaged for the work specified in this Section shall be employees of a firm regularly employed in pre-construction building surveying and licensed in the State of New York. Employees of the Contractor and/or its various other subcontractors will not be considered acceptable.
- B. Equipment used in the production of survey required by this Section shall be commercial grade.
- C. The work at site shall be carried out under full time supervision by qualified personnel. Qualified personnel shall be responsible for and capable of coordinating the work of the surveying team, setting out the work accurately, identifying immediately and positively the type of instruments to be deployed and the methodology of surveying to achieve speed and accuracy in the work.
- D. Surveyor shall consult with Engineer to determine minimum acceptable level of detail to support the design and construction improvements.
- E. The contractor is responsible for arranging with Playland staff the rights-of-entry to their property in order to engage in condition surveys, settlement monitoring, etc.
- F. The bidder must visit the site prior to submitting his quotations to acquaint themselves fully with the nature, type, scope of work and involvement therein.
- G. The photographer provided for the work specified in this Section shall be employees of a firm regularly employed in construction and the production of commercial photographs. Employees of the Contractor and/or its various other subcontractors will not be considered acceptable.
- H. Equipment used in the production of the photographs required by this Section shall be commercial grade.

1.4 PHOTOGRAPH ARCHIVE

- A. The photographer shall retain all photographs for a minimum of two (2) years from the date of completion of the project.

PART 2 PRODUCTS – Not Used

PART 3 EXECUTION

3.1 GENERAL

- A. Provide the services of a competent commercial surveyor licensed in the State of New York and develop and print survey report and drawings of preconstruction conditions, job progress and the completed project, as ordered by the Engineer.

CONTRACT No. 22-523
DIVISION 1 – GENERAL CONDITIONS

- B. Document all aspects of the structural condition through observations, actual measurements, plan sketches, photographs, and any other data the preparer may deem appropriate.
- C. For the pre-construction survey drawings, the contractor shall provide a detailed survey of the following existing structures:
 - 1. Cross Axis Building A
 - 2. Cross Axis Building D
 - 3. Cross Axis Building E
 - 4. Cross Axis Building F
 - 5. Dragon Coaster Vendors
 - 6. Restaurant Kitchen with Food Vending
 - 7. Southeast Arcade
 - 8. Northeast Burger Barn
- D. Detailed survey shall establish the following:
 - 1. Building footprint, interior layouts and elevations,
 - 2. Building structural columns (lengths, widths and heights),
 - 3. Floor and roof framing (lengths, widths, heights and spacing),
 - 4. Floor levels and Roof heights
 - 5. Wall elevation window and door openings,
 - 6. Exterior aesthetic features,
- E. All measurements shall be taken to the nearest 1/8 of an inch.
- F. Provide the services of a competent commercial photographer to take, develop and print color photographs of preconstruction conditions, job progress and the completed project, as ordered by the Engineer.
- G. The number, frequency, camera angle, and area covered by each photograph shall be dictated by the number, size and range of physical features which could be disturbed or have been constructed and whose identification must be assured in a photograph.
- H. Photographs which have received too great or too little lighting during filming or which was not ordered by the Engineer shall be unacceptable and shall not be counted against the number of photographs or video required. The Engineer will be the sole judge of acceptability.
- I. The actual number of photographs to be taken shall be the number required to produce the above number of photographs acceptable to the Engineer in both content and appearance. The photographer shall walk the site with the Contractor and the Engineer and the Engineer shall direct the photography with regards to the location of each photograph.

3.2 PRE-CONSTRUCTION PHOTOGRAPHS

- A. Photographs shall be taken of all physical features on Owner's, private or public property which may be disturbed by the construction operations associated with the project. Such photographs shall be taken just prior to the start of construction in a particular area.

1. Photographs
 - a. Total number of acceptable preconstruction photographs will be limited to a maximum of one hundred (100) per structure listed above.
 - b. Photographs required to document conditions at Contractor's staging areas will not be included in the above maximum total number of photographs.

3.3 PROGRESS PHOTOGRAPHS DURING CONSTRUCTION

- A. The photographer shall photograph the progress of the work, documenting both ongoing and completed work, as directed by the Engineer.
- B. Progress photographs shall be taken at least once per month at a date and time to be coordinated with the Engineer.
- C. A total of fifty (50) acceptable photographs shall be provided each month for the duration of the project.
- D. Only one day's notice shall be required for any photographs to be taken.

– END OF SECTION –

SECTION 02 01 00 - MAINTENANCE OF EXISTING CONDITIONS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Location of facilities.
 - 2. Notification of owners and authorities.
 - 3. Coordination and preparation.
 - 4. Protection of facilities.
 - 5. Relocation of facilities.
 - 6. Protection of sewers, storm drains and underground piping.
 - 7. Protection of water mains near sewers.
 - 8. Abandonment of utilities.
 - 9. Restoration of property markers.

PART 2 PRODUCTS – Not Used

PART 3 EXECUTION

3.1 LOCATION OF FACILITIES

- A. Prior to construction, verify location of existing underground facilities near or adjacent to project.
 - 1. Consult with Underground Facilities Protection Organization (Dig Safely New York) and owners of facilities and arrange for field stake-out or other markings to show locations.
 - 2. Perform exploratory excavation at key junctures and other critical points to aid in ascertaining locations.
- B. Report field stakeout findings and results of exploratory excavations to Engineer if possible changes in project location or design are indicated because of suspected interferences with existing facilities. Allow Engineer sufficient time to determine magnitude of changes and to formulate instructions in that regard.
- C. If location of an existing underground facility is uncertain, apply careful excavation and probing techniques during construction to locate and avoid damage to same.

3.2 NOTIFICATIONS OF OWNERS AND AUTHORITIES

- A. Prior to construction, notify owners of existing facilities, including local Police and Fire Departments, of general scope, nature and planned progress schedule of the Work.
- B. Notify owners of nearby underground facilities when excavating or blasting is to take place in a particular area, allowing them reasonable time to institute precautionary procedures or preventive measures which they deem necessary for protection of their facilities.

CONTRACT NO. 22-523
DIVISION 2 – EXISTING CONDITIONS

- C. When existing utilities, such as sewer, water, gas, telephone or electric power are damaged or disturbed during construction, immediately notify affected Owner and Project Owner.
- D. Notify Police and Fire Departments, including affected owners, immediately if hazardous conditions are created or have the potential for occurring, as a result of damage to an existing facility or as a result of other activities at project site. Hazardous conditions could be created from: fire, explosion, escape of gas, escape of fuel oil, gasoline or industrial fluids, downed electrical wires, and disrupted underground electrical cables.

3.3 COORDINATION AND PREPARATION

- A. Discuss anticipated work schedule with local authorities and owners of utilities at preconstruction meeting, including procedures to be followed if one or more utilities are damaged or disrupted. Develop contingency plans to address Contractor's role in repair of damaged utilities.
- B. Make preparations beforehand to repair and restore damaged utilities, including arrangements for standby materials and equipment to be promptly assembled at site and utilized immediately.
- C. Adjust work schedules and personnel assignments as necessary to conform with requirements of utility owner whose utility is to be temporarily interrupted during construction. Cooperate with utility owner in this regard to minimize the time of interruption.
- D. Make preparations for and conform to applicable federal, state, and local regulations regarding use of proper safeguards and procedures when excavation and/or blasting is to take place in close proximity to existing facilities and structures.
- E. Make preparations for and conform to applicable requirements of New York State Industrial Code Rule 53 (as amended April 1, 1975) entitled, "Construction, Excavation and Demolition Operations at or Near Underground Facilities," issued by State Department of Labor.

3.4 PROTECTION OF FACILITIES

- A. Plan and conduct construction operations so that operation of existing facilities near or adjacent to the Work, including electric, telephone, sewer, water, gas or drainage utilities, are sustained insofar as the requirements of the project will permit.
- B. Protect existing facilities from damage or movement through installation of adequate support systems and use of proper equipment, including application of careful excavation and backfilling techniques in sensitive areas.
- C. In locations where blasting is to take place, and in cooperation with owners of nearby facilities, provide special protection and support of underground facilities which may be

CONTRACT NO. 22-523
DIVISION 2 – EXISTING CONDITIONS

vulnerable to damage by virtue of their physical location or condition, and which could create hazardous conditions if damaged.

- D. Existing utilities and other facilities which are damaged by the Contractor's construction operations shall be promptly repaired by Contractor to the satisfaction of the affected owner or, if he so elects, that owner will perform the repairs with his own forces. Under either arrangement, such repair work shall be done at Contractor's expense.
- E. When aboveground visible facilities such as poles, wires, cables, fences, signs or structures constitute an unavoidable interference, notify Engineer and consult with affected owner regarding temporary removal and later restoration of the interfering item. Arrange with that owner to remove and later restore the interfering item to the satisfaction of the owner, subject to approval of the project Owner; or, allow affected owner to perform such work with his own forces. Under either arrangement, such work shall be done at Contractor's expense.
- F. Take all necessary precautions to prevent fires at or adjacent to the work, buildings, and other facilities. No burning of trash or debris is permitted. If permanent fire extinguishers are used, they shall be recharged and in "new" condition when turned over to Owner.

3.5 PROTECTION OF SEWERS, STORM DRAINS AND UNDERGROUND PIPING

- A. Where existing sanitary sewers or storm drain systems are being replaced or interrupted, provide temporary bypass pumping or piping to maintain flow around that segment of the Work such that no back-ups occur in existing systems.
- B. Existing sanitary sewer laterals damaged in the work or temporarily disconnected shall be restored to operation by the end of each work day. Existing sanitary sewer laterals crossing over new pipelines to be restored in accordance with details shown on the Drawings.
- C. Maintain existing manholes, catch basins, and other utility structures in their pre-work condition. Any material or debris entering same due to the Contractor's operation shall be promptly removed.
- D. Underground piping and utilities that are to remain shall be protected and temporarily supported during excavation and concrete placement.

3.6 PROTECTION OF WATER MAINS NEAR SEWERS

- A. Where a minimum 10-foot horizontal separation or minimum 18-inch vertical separation (bottom of water pipe to top of sewer pipe) cannot be maintained between a water main and sewer line, one or more of the following remedies shall be incorporated in the work:
 - 1. The sewer lines shall be encased in 4,000 psi concrete for a length of 10 feet on either side of the water main. Concrete shall be in accordance with Section 03 30 00.
 - 2. Both the water main and sewer line shall be constructed of pressure type joints of ductile iron pipe, and shall be pressure tested to 100 psi to assure watertightness.

CONTRACT NO. 22-523
DIVISION 2 – EXISTING CONDITIONS

3. One full length of water main shall be centered over the sewer line, so that both joints will be as far from the sewer as possible.
4. Relocate water main to obtain 18-inches minimum vertical separation.

3.7 ABANDONMENT OF UTILITIES

- A. Remove existing utilities to be abandoned within limits of trench excavation, or impinging on trench limits.
- B. Open ends of abandoned utilities, or those scheduled for abandonment, shall be bulkheaded by brick masonry or 4,000 psi concrete; or by cast iron plugs or caps in small diameter water mains.
- C. Abandoned sewers 36-inch diameter or larger shall be completely filled with sand or gravel or other approved material prior to bulkheading the open end(s).
- D. Abandoned manholes and water valve casings shall be backfilled to grade with approved trench backfill material.
- E. Frames, covers, grates, water valve casing, sections of water piping, hydrants (including standpipe and boot) valves and other items to be abandoned shall, if ordered by Owner, be salvaged for re-use and be delivered to Owner's property yard.

3.8 RESTORATION OF PROPERTY MARKERS

- A. Property corner markers, boundary monuments, etc., disturbed or moved by the Contractor's operation shall be restored, in conformance with the property deed description, by a licensed land surveyor. Restoration of the property corner markers or boundary monuments shall be certified by said surveyor on a map prepared by him which shows the work accomplished. One copy of the map shall be given to the property owner and one copy given to the project Owner.

– END OF SECTION –

SECTION 02 41 16 - STRUCTURE DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

- A. Contractor shall demolish existing structures and remove from the project site including all architectural, structural, electrical, HVAC, plumbing and other elements, equipment, piping, components, accessories, and miscellaneous items, whether above ground or below ground, required to accomplish the work and for proper performance of the Contract, as shown on the Contract Drawings, specified herein and approved by the Engineer.

1.2 GENERAL

- A. Except as modified by governing codes and by this Specification, comply with the applicable provisions and recommendations of latest editions of the following.
- B. Where the language in any of the documents referred to herein is in the form of a recommendation or suggestion, such recommendations or suggestions shall be deemed to be mandatory under this Contract unless otherwise directed by the Engineer.
- C. Conflicts: Conform to requirements of cited standard unless specified otherwise. In case of apparent conflict between standards, or between standards and the specifications herein, the more stringent shall apply unless otherwise directed by the Engineer.

1.3 SUBMITTALS

- A. Review of the Demolition Plan by the Engineer will not relieve the Contractor of complete responsibility for the successful performance of the work in accordance with all applicable Federal, State, and local codes and restrictions.
- B. Demolition Plan: A detailed Demolition Plan, signed and sealed by a Professional Engineer registered in the State of New York, shall be submitted to the Engineer at least 30 calendar days prior to commencement of demolition work. The demolition plan shall include, but not be limited to:
 - 1. A detailed outline of intended demolition and disposal procedures.
 - 2. Where applicable, design calculations prepared by a Professional Engineer registered in the State of New York verifying stability of structure elements during demolition, and for the design of shoring or bracing to be provided during demolition operations.
 - 3. List of equipment to be used in demolition operations.
 - 4. Demolition equipment data.
 - 5. Demolition sequence and schedule.
 - 6. Demolition materials disposal plan including disposal location.

- C. Separate Demolition Plans shall be submitted for the following areas of work:
 - 1. Cross Axis Building A
 - 2. Cross Axis Building F
 - 3. Dragon Coaster Vendors
 - 4. Restaurant Kitchen with Food Vending
 - 5. Southeast Arcade
 - 6. Northeast Burger Barn

1.4 REGULATORY AND SAFETY REQUIREMENTS

- A. Comply with Federal, State, and local hauling and disposal regulations.
- B. Obtain all permits and provide all necessary notifications required by Federal, State, and local jurisdictions for all phases and operations of the Work.
- C. All work shall be accomplished in a manner to provide for the safety of the workmen, public and others who might be affected by the work. Safety requirements shall include adherence to all applicable Federal, State, and local safety regulations, codes and ordinances. The Contractor shall install and maintain all necessary barricades, lights, and other safety appurtenances required to maintain the safety of these operations in accordance with the above codes.

1.5 DUST AND DEBRIS CONTROL

- A. Prevent the spread of dust and debris to other areas of the project site and avoid the creation of a nuisance or hazards in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution. Vacuum and dust the work area daily and sweep pavements as often as necessary to control the spread of dust and debris.
- B. The Contractor will be held responsible for the immediate removal of all spillage on the roads and other areas, both on and off site.

1.6 PROTECTION

- A. The Contractor shall make provision for the protection of all existing structures, utilities, trees, and other objects that may be damaged in the course of the Contractor's demolition operations.
- B. Take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Owner. Repair or replace damaged items as approved by the Engineer. Coordinate the work of this section with all other work indicated. Construct and maintain shoring, bracing, and supports as required. Ensure that structural elements are not overloaded. Increase structural supports or add new supports as may be required as a result of any cutting, removal, deconstruction, or demolition work performed under this contract. Do not overload structural elements or pavements to remain. Provide new supports and reinforcement for existing construction weakened by

CONTRACT No. 22-523
DIVISION 2 – EXISTING CONDITIONS

demolition or removal work. Repairs, reinforcement, or structural replacement require approval by the Engineer prior to performing such work.

- C. Do not disturb existing construction beyond the extent indicated or necessary for installation of new construction. Provide temporary shoring and bracing for support of building components to prevent settlement or other movement. Provide protective measures to control accumulation and migration of dust and dirt in all work areas. Remove dust, dirt, and debris from work areas daily.
- D. For portions of the building to remain, protect building interior and materials and equipment from the weather at all times. Where removal of existing roofing is necessary to accomplish work, have materials and workmen ready to provide adequate and temporary covering of exposed areas.
- E. Protect trees within the project site from damage during demolition which are indicated to be left in place. Replace any tree designated to remain that is damaged with like-kind or as approved by the Engineer.
- F. Maintain existing utilities indicated to stay in service and protect against damage during demolition operations. Prior to start of work, verify the location and status of all utilities, piping and conduit within the limits of demolition. Utilities, piping and conduit will be shut off by the Owner or utility and disconnected and sealed by the Contractor.
- G. Protect equipment, and electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections.
- H. Floors, roofs, walls, columns, pilasters, and other structural components that are designed and constructed to stand without lateral support or shoring, and are determined to be in stable condition, must remain standing without additional bracing, shoring, or lateral support until demolished, unless directed otherwise by the Engineer. Ensure that no elements determined to be unstable are left unsupported and place and secure bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, or demolition work performed.
- I. Before, during and after demolition the Contractor shall continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the project site. No area, section, or component of floors, roofs, walls, columns, pilasters, or other structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

1.7 BURNING

- A. The use of burning at the project site for the disposal of refuse and debris, or facilitate demolition will not be permitted

CONTRACT No. 22-523
DIVISION 2 – EXISTING CONDITIONS

1.8 USE OF EXPLOSIVES

- A. The use of explosives will not be permitted.

1.9 HAZARDOUS AND TOXIC MATERIALS

- A. Remove all hazard and toxic substances in accordance with the Contract requirements.

1.10 MATERIALS AND EQUIPMENT TO BE RELOCATED OR SALVAGED

- A. Perform the removal and reinstallation of relocated items, or removal and placement in storage of salvaged items as indicated with workmen skilled in the trades involved.
- B. Items to be relocated or salvaged and stored which are damaged by the Contractor shall be repaired or replaced with new undamaged items as approved by the Engineer.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.1 GENERAL

- A. The method of demolition to be used by the Contractor to satisfactorily complete the work under this section is left to the Contractor's option. However, before any demolition is started a schedule and method of operation shall be submitted to the Engineer for approval. No demolition shall be started or allowed without an approval from the Engineer.

3.2 PREPARATION

- A. Contractor shall engage an independent Professional Engineer registered in the State of New York to prepare a Demolition Plan. The Professional Engineer shall provide an assessment of the existing structure, including structural analysis, temporary shoring, temporary bracing and sequence of construction as required.
- B. Remove items scheduled to be salvaged for the Facility, and place in designated storage area.
- C. Protect adjacent Work from damage during demolition.
- D. Protect existing construction during demolition from damage.
- E. Provide protection from adverse weather conditions for portions of the Project that will be exposed during demolition operations.

- F. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- G. Do not cut existing pipe, conduit, ductwork, or other utilities serving facilities scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 DEMOLITION

- A. Demolition shall be complete and include removal of all architectural, structural, electrical, HVAC, plumbing and other elements, equipment, piping, components, accessories, and miscellaneous items, whether above ground or below ground, required to accomplish the work.
- B. Perform demolition in a systematic manner, beginning at the top of the structure and proceeding to lowest level. Complete demolition above each floor level before disturbing supporting members on lower levels.
- C. Wet down masonry and plaster materials during demolition to prevent spread of dust and dirt. Sprinkle debris and use temporary enclosures as necessary to limit dust to lowest practicable level. Do not use water to extent causing flooding, contaminated runoff, or icing.
- D. Do not place demolition equipment in buildings where it will create excessive loads on supporting walls, floors, and frames. Promptly remove accumulated debris and materials.
- E. Demolish concrete and masonry walls in small sections. Remove structural framing members and lower to ground by means of derricks, platforms hoists, or other suitable methods.
- F. Sawcut and remove masonry so as to prevent damage to surfaces to remain and to facilitate the installation of new work. Where new masonry adjoins existing, the new work shall abut or tie into the existing construction as indicated. Provide square, straight edges and corners where existing masonry adjoins new work and other locations.
- G. Saw concrete along straight lines full depth unless otherwise indicated on the Contract Drawings. Make each cut in walls perpendicular to the face and in alignment with the cut in the opposite face.
- H. Dismantle structural steel at field connections. Do not use flame-cutting torches unless other methods of dismantling are not practical.
- I. Disconnect piping at unions, flanges and valves, and fittings as required to reduce the pipe into straight lengths. If the piping that remains can become pressurized due to upstream valve failure, end caps, blind flanges, or other types of plugs or fittings with a pressure gage and bleed valve shall be attached to the open end of the pipe to ensure positive leak control. Carefully dismantle piping that previously contained gas, gasoline, oil, or other dangerous fluids, with precautions taken to prevent injury to persons and property. Store piping outdoors until all fumes and residues are removed.

- J. Remove and dispose of materials containing asbestos and lead in accordance with the contract document requirements.

3.4 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner'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 Owner's property and legally dispose of them.

3.5 CLEANING

- A. Clean areas and spaces where cutting, coring and patching are performed. Clean piping, conduit, or similar constructions before applying paint or other finishing materials. Restore damaged coverings of pipe and other utilities to original condition.

– END OF SECTION –

SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. The Work of this Section includes all labor, materials, equipment and services necessary to complete the selective demolition work as shown on the drawings and/or specified herein, including but not limited to the following:
 - 1. Alterations, selective demolition and removals as noted on drawings and as required to accommodate new construction.
 - 2. Removal of debris.
 - 3. Protection of existing building and spaces to remain and shoring of the structure as required for structural integrity and personal safety.
 - 4. Alterations, selective demolition and removals of building exterior where noted.
 - 5. Patching and refinishing of existing surfaces damaged as a result of this work.
 - 6. Protection.

1.3 QUALITY ASSURANCE

- A. The Contractor shall comply with the requirements of all applicable Federal, State and local safety and health regulations regarding the demolition of structures including ANSI/NFPD 241-Building Construction and Demolition Operations.
- B. The Contractor shall be responsible for any damage to any adjacent structures or buildings to remain.
- C. Qualifications: Qualifications of Contractor for work of this Section shall not be less than ten (10) years of field experience in work of this nature.
- D. Professional Engineering: The Contractor shall retain the services of a Professional Engineer licensed in the State of New York, who shall design and supervise installation of all underpinning and shoring.

1.4 RELATED SECTIONS

- A. Alteration and removal requirements for mechanical and electrical work - Mechanical and Electrical Sections.

CONTRACT No. 22-523
DIVISION 2 – EXISTING CONDITIONS

1.5 SUBMITTALS

- A. Schedule of Demolition Operations: Submit demolition procedures and operational sequence for Architect's review prior to start of work. Submit a written request to Architect well in advance of executing any cutting or alteration which affects:
 - 1. The work of tying in or connecting to operational systems of the building, including electrical, mechanical and security systems.
 - 2. The work of the Owner or any separate Contractor.
 - 3. The structural value or integrity of any element of the project or of adjacent structures.
 - 4. The integrity or effectiveness of weather-exposed and moisture-resistant elements or systems.
 - 5. The efficiency, operational life, maintenance, or safety of operational elements or systems.
- B. Notice of Differing Conditions: Submit a written notification if, during the work of demolition and cutting, conditions are discovered which significantly vary from those shown on the drawings. Do not commence work until approval of Architect.
- C. Shop Drawings: Submit the following prior to starting work:
 - 1. Submit for Architect's information shop drawings indicating location and typical construction details of temporary dustproof and weatherproof partitions.
 - 2. Submit drawings of temporary structural shoring, bracing, framing or support, for the information of the Architect. Such drawings will be reviewed by the Structural Engineer for the effects of such temporary members on the structural elements to remain. These drawings shall include the reason for such temporary members, the location, the direction and magnitude of design reaction forces on existing structure, and details showing how these reaction forces will be applied to the existing structure.
 - a. Shop drawings shall be submitted with the seal of the Professional Engineer engaged by Contractor; Professional Engineer must be licensed in the State of New York.
 - b. The Architect will receive acknowledgment for concepts shown. Such acknowledgments shall be of the concept only and not of actual capacities or structural design and shall not in any way diminish or limit the Contractor's responsibility for the quality and performance of the work and for protecting existing structures and facilities.

1.6 SPECIAL PRECAUTION

- A. Hazardous materials may be encountered during demolition operations including asbestos; comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.

CONTRACT No. 22-523
DIVISION 2 – EXISTING CONDITIONS

1.7 JOB CONDITIONS

A. Condition of Structure

1. The Contractor for the work of this Section shall be held to have visited the site, examined the premises, determined for himself the existing conditions, character of equipment and facilities needed for the performance of the work, and all matters which may in any way affect the work before submitting a bid.
 - a. Information regarding existing construction or conditions is based on available record drawings which may or may not truly reflect existing conditions. Such information is included on the assumption that it may be of interest to the Contractor, but the Architect, Owner and their consultants do not assume responsibility for its accuracy or completeness.
 - b. Notify the Architect if, during the course of demolition, conditions are discovered which significantly vary from those shown on the drawings. Do not proceed until authorized by Architect.
2. The Contractor shall accept the condition of the site and structures as found. The Architect and Owner assume no responsibility for condition of site or structures nor the continuation of the condition existing at time of bidding or thereafter.

B. Areas of building to be demolished or altered will be vacated and discontinued in use prior to the start of the work.

1. Surrounding areas of the building shall remain operational by the Owner.

C. Partial Removal

1. Items of savable value to the Contractor may be removed from the structure as the work progresses. Salvaged items must be transported from the site as they are removed.
2. Storage or sale of removed items on the site will not be permitted.

D. Explosives: The use of explosives will not be permitted.

E. Traffic

1. Conduct demolition operations and the removal of debris to ensure minimum interference with roads, streets, walks and other adjacent occupied or used facilities.
2. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

F. Utilities

1. Refer to Division 22 and 26 of the specifications for special requirements concerning utilities and services.

CONTRACT No. 22-523
DIVISION 2 – EXISTING CONDITIONS

2. Maintain any existing utilities required to remain; keep in service and protect against damage during demolition operations.
3. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to the governing authorities.
4. Disconnect and seal any abandoned utilities before starting demolition operations. Coordinate all work with local utility companies having jurisdiction.

1.8 SCHEDULING

- A. Before commencing any alteration or demolition work, submit for review by the Architect, and approval of the Owner, a schedule showing the commencement, the order, and the completion dates for the various parts of this work.
- B. Before starting any work relating to existing utilities (electrical, sewer, water, heat, gas, fire lines, etc.) that will temporarily discontinue or disrupt service to the structures to remain, notify the Architect and the Owner 7 days in advance and obtain the Owner's approval in writing before proceeding with this phase of the work.

PART 2 PRODUCTS

Refer to Part 3 - Execution, for Product Requirements

PART 3 EXECUTION

3.1 PROTECTION

- A. Take full precautions to protect workmen, passersby, or any other persons from falling debris and other hazards of demolition operations.
- B. Execute demolition work to insure protection of existing portions of building to remain against damages which might occur from falling debris or other cause. Do not interfere with use of adjacent occupied buildings and areas. Maintain free, safe passage to and from occupied adjacent buildings.
- C. Materials Placement: Do not load structure with weight that will endanger, overload or cause excessive deflection of the existing structure, or that will damage finished surfaces adjacent to and/or supported by the existing structure, except portions being removed.
- D. Construction Operations: Do not employ any construction operation, equipment or vehicles that will endanger, overload or cause excessive deflection of the existing structure, or that will damage finished surfaces adjacent to and/or supported by the existing structure, except portions being removed.
- E. Take precautions to guard against movement, settlement, damage, or collapse of any part of building, sidewalks, adjacent property or street passages; be liable for any such

CONTRACT No. 22-523
DIVISION 2 – EXISTING CONDITIONS

- movement, settlement or collapse. If such damage does accidentally occur, Contractor shall repair promptly at no cost to Owner.
- F. Provide the necessary safeguards to prevent accidents, to avoid all necessary hazards and protect the public, the work and property at all times, including Saturdays, Sundays, and holidays.
- G. Be responsible for any and all damages which may arise or occur to any party whatsoever by reason of the neglect in providing proper lights, guards, barriers, or any other safeguards to prevent damage to property, life and limb.
- H. Make such explorations and probes as are necessary to ascertain any required protective measures before proceeding with demolition and removal. Give particular attention to shoring and bracing requirements so as to prevent any damage to existing construction.
1. Provide interior and exterior shoring, bracing, or support to prevent movement or settlement or collapse of structures to be demolished and adjacent facilities to remain. The Contractor's Professional Engineer shall advise on bracing, shoring, underpinning, or other structural requirements. The Contractor shall bear all responsibility for prevention of movement or other structural fault.
 2. The Contractor shall restore, by repair or otherwise, the portions of structure or their contents altered by the Contractor in furtherance of his underpinning and support operations. Restoration shall be completed to the conditions which existed prior to the start of the work. Any damage caused by inadequate support shall also be restored by the Contractor at no cost to the Owner.
- I. Provide, erect and maintain catch platforms, lights, barriers, weather protection, warning signs, and other items as required for proper protection of the workmen engaged in demolition and alteration operations, occupants of the building, public and adjacent property. Any damage caused by the Contractor's operations shall be promptly repaired by the Contractor at no cost to the Owner.
- J. Provide and maintain temporary protection of the existing structure designated to remain where demolition, removal, and new work are being done, connections made, materials handled, or equipment moved.
- K. Take necessary precautions to prevent dust and dirt from rising. Protect unaltered portions of the existing building affected by the operations under this Section by dustproof partitions and other adequate means.
- L. Provide adequate fire protection in accordance with local Fire Department requirements.
- M. Be responsible for any damage to the existing structure or contents by reason of the insufficiency of protection provided.
- N. Promptly repair damages caused to adjacent facilities by demolition operations at no cost to the Owner.

CONTRACT No. 22-523
DIVISION 2 – EXISTING CONDITIONS

- O. Provide and maintain weather protection at exterior openings so as to fully protect the interior premises against damage from the elements until such openings are closed by new construction.

3.2 INSPECTION

- A. Verify that areas of demolition work are protected and temporary dustproof partitions have been installed.
- B. Verify that construction to be removed is not load bearing or has been properly braced, framed or supported.
- C. Inspect existing conditions of the project, including elements subject to damage or to movement during demolition and cutting.
- D. After uncovering work, inspect the conditions affecting the installation or performance of the work.
 - 1. Report differing or questionable conditions to the Architect in writing; do not proceed with the work until the Architect has provided further instructions.

3.3 PREPARATION

- A. Provide adequate temporary support as necessary to assure the structural value or integrity of the affected portion of the work
- B. Provide devices and methods to protect other portions of the project from damage.
- C. Pollution Controls
 - 1. Use water sprinkling, temporary enclosures, and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical level. Comply with governing regulations pertaining to environmental protection.
 - a. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.
 - 2. Clean adjacent structures and improvements of dust, dirt and debris caused by demolition operations. Return adjacent areas to condition existing prior to the start of the work.
 - 3. Provide drainage for temporary water use.

3.4 DEMOLITION AND CUTTING

- A. Selectively demolish existing construction in conformance with the drawings and these specifications.
 - 1. Execute cutting and demolition by methods which will prevent damage to other work and will provide proper surface to receive installation of work by others and patching of finish surfaces.

CONTRACT No. 22-523
DIVISION 2 – EXISTING CONDITIONS

2. Do all cutting or removal so as to leave neat, true, plumb and square edges, at edges to remain. Use carborundum or diamond saw equipment for cutting masonry, concrete and stone work, where edges or surfaces are to remain.
3. Do not cut or remove construction which might weaken or impair the structural integrity or strength of the structural framing or support systems which are to remain.
4. Demolish and remove materials as shown on the drawings without damage to the remaining parts of the structure or mechanical/electrical/utility systems.
5. Remove materials so as to not impose excessive loads in supporting walls, floors or framing and so as not to damage remaining undemolished portions of the structure.
6. Where portions of structures are to be removed, remaining portions shall be protected from damage and prepared to fit new construction. Damage to portions of structures to remain shall be repaired.
7. Reinforcing steel in existing structures shall be left in place, cleaned and aligned to provide tie with new work.
8. Existing waterproofing systems and flashings shall be carefully exposed and protected to maintain workable conditions of fitting new work with existing construction.
9. Proceed with demolition in a systematic manner.
10. Demolish concrete and masonry in small sections.
11. Remove structural framing members and lower to ground by means of hoists, derricks, or other suitable methods.

B. Shoring

1. Design, provide, erect and maintain necessary temporary shoring, bracing, framing, or support where load bearing structural or supporting members are removed or weakened by cuts or openings or are subject to damage from demolition operations, and otherwise as required for safety or to protect finish surfaces from damage.
2. Construction and adequacy of the shoring shall be the entire responsibility of the Contractor. Any damage caused by the inadequacy of the shoring or other support shall be the responsibility of the Contractor to remedy at no additional expense to the Owner.
3. Shoring and bracing shall remain until new structural framing and/or supports are installed. Coordinate operations fully with other trades.
4. Be ready at any time to promptly provide, add to, or strengthen temporary shoring, bracing, or support for existing work, in case existing construction begins to show signs of structural stress.

CONTRACT No. 22-523
DIVISION 2 – EXISTING CONDITIONS

3.5 WORKMANSHIP STANDARDS FOR ALTERATION AND REMOVAL WORK

- A. Cut, remove, alter, temporarily remove and replace, or relocate existing work as required for performance of the work. Perform such work required with due care, including shoring and bracing.
- B. Coordinate patching involving the various trades whether or not specifically mentioned in the respective specification Sections.
- C. Materials or items demolished and not designated to become the property of the Owner or to be reinstalled shall become the property of the Contractor and shall be removed from the Owner's property.
- D. Execute the work in a careful and orderly manner, with the least possible disturbance to the public and to the occupants of the adjacent buildings.
- E. In general, demolish masonry in small sections. Where necessary to prevent collapse of any construction, install temporary shores, struts, or bracing.
- F. Where existing equipment and/or fixtures are indicated to be reused, repair such equipment and/or fixtures and refinish to put in perfect working order. Refinish as directed.
- G. Cut out embedded anchorage and attachment items as required to properly provide for patching and repair of the respective finishes.
- H. Confine cutting of existing roof areas designated to remain to the limits required for the proper installation of the new work. Cut and fold back existing roofing. Cut and remove insulation and related items. Provide temporary weathertight protection as required until new roofing and flashings are installed. Consult the Owner to ascertain if existing guarantee bonds are in force and execute the work so as not to invalidate such bonds.
- I. Where utilities are removed, relocated or abandoned, cap, valve, plug, or by-pass to make complete and working installation.
- J. Restore existing pipe and duct coverings damaged by work under this Contract to original undamaged condition.
- K. Immediately restore to service and repair any damage caused by Contractor's workmen to existing pipe and conduits, wires, cables, etc., of utility services or of fire protection systems and communications systems which are not scheduled for discontinuance or abandonment.
- L. Upon completion of contract, deliver work complete. Damage that may be caused by Contractor or Contractor's workmen to existing structures designated to remain, grounds, and utilities shall be repaired by Contractor and left in as good condition as existed prior to damaging.
- M. Restore finish work of floors, walls, and ceilings remaining in place but damaged or defaced because of demolition or alteration work to condition equal that which existed at beginning of work under this Contract.

CONTRACT No. 22-523
DIVISION 2 – EXISTING CONDITIONS

- N. Where alteration or removals expose damaged or unfinished surfaces or materials, refinish such surfaces or materials, or remove them and provide new or salvaged materials to make continuous surfaces uniform.
- O. Perform new work and restore and refinish existing work in conformance with applicable requirements of the specifications, except as follows:
 - 1. Materials for use in repair of existing surfaces, but not otherwise specified, shall conform to the highest standards of the trade involved, and be in accordance with approved industry standards, and shall be as required to match existing surfaces.
 - 2. Workmanship for repair of existing materials shall, unless otherwise specified, be equal to similar workmanship existing in or adjacent to the space where the work is being done.
 - 3. Installation of salvaged items where no similar items exist shall be done in accordance with the highest standards of the trade involved and in accordance with approved shop drawings.
- P. Materials or items designated to become the property of the Owner shall be as shown on the drawings. Remove such items with care and store them in a location at the site to be designated by the Owner.
- Q. Materials or items designated to be reinstalled shall be as shown on the drawings. Remove such items with care under the supervision of the trade responsible for reinstallation; protect and store until required. Replace materials or items damaged in their removal with similar new material.
- R. The existing building shall not be used as a workshop. Furnishings or equipment in any room shall not be used as work benches. Should any damage occur during the progress of the work to any furniture, fixtures, equipment, or appurtenances therein, such damage shall be repaired, replaced or made good by the Contractor without extra cost to the Owner.
- S. Finish new and adjacent existing surfaces as specified for new work. Clean existing surfaces of dirt, grease and loose paint before refinishing.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General
 - 1. Remove from the site debris, rubbish and other materials resulting from work of this Section.
 - 2. Burning of removed materials from demolished structures will not be permitted on the site.
- B. Removal: Transport materials removed from demolished structures and legally dispose of off site. Pay any and all fees associated with disposal work. Leave the site in an orderly condition to the approval of the Architect.

CONTRACT No. 22-523
DIVISION 2 – EXISTING CONDITIONS

3.7 CLEANING UP

- A. Remove debris as the work progresses. Maintain existing premises in a neat and clean condition.

END OF SECTION

SECTION 02 82 00 – ASBESTOS REMOVAL

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. This asbestos abatement Project will consist of the removal and disposal of asbestos containing materials (ACM) and presumed asbestos containing materials (PACM) at Building Structures - Rye Playland, located at 1 Playland Parkway, Rye, NY 10580.
- B. All work shall be performed in accordance with Part 56 of Title 12 of Official Compilation of Codes, Rules and Regulations of the State of New York, (Industrial Code Rule 56). The work shall include the removal of the following materials:

Structure	Location	Material	Approximate Quantity (SF/LF/Unit)	ICR 56 Procedure
CXF Cross Axis Building E (South Games Buildings)	Roof WA 1	Fascia Board	560 SF	56.11.6
	Exterior WA 2	Column Caulk	55 SF	56.11.6
CXA Cross Axis Building A (North Games Building)	Exterior WA 1	Transite Siding	900 SF	56.11.6
	Interior WA 2	Transite Siding	820 SF	
	Interior WA 3	Gray 9"x9" Floor Tile	100 SF	
DCV Dragon Coaster Vendors	Roof WA 1	Transite Panel Board	2600 SF	56.11.6
		Mastic (Bottom)		
		Flashing		
		Shingles & Felt Paper		
	Exterior WA 2	Transite Panels	1500 SF	
	Exterior WA 3	Roof Flashing	400 SF	
	Exterior WA 4	Roof Flashing	400 SF	
AR Northeast Arcade	Roof WA 1	Roof Tar Paper	3000 SF	56.11.6
	Exterior WA 2	Transite Siding	800 SF	
CXD Cross	Exterior WA 1	Fascia Board	1700 SF	56.11.6

CONTRACT No 22-523
 DIVISION 2 - EXISTING CONDITIONS

Axis Building D (South Games Buildings)	Exterior WA 2	Column Caulking	600 SF	56.11.6
CXE Cross Axis Building E (South Games Buildings)	Roof WA 1	Fascia Board	1140 SF	56.11.6
	Exterior WA 2	Column Caulk	79 SF	56.11.6

1.2 SPECIAL JOB CONDITIONS

A. Any special job conditions, including variances obtained by the Owner, are described below:

1. The Contractor shall be aware of all conditions of the Project and is responsible for verifying quantities and locations of all Work to be performed. Failure to do so shall not relieve the Contractor of its obligation to furnish all labor and materials necessary to perform the Work.
2. All Work shall be performed in strict accordance with the Project Documents and all governing codes, rules, and regulations. Where conflicts occur between the Project Documents and applicable codes, rules, and regulations, the more stringent shall apply.
3. All abatement work shall be coordinated with General Contractor work; Abatement may be phased with other contract work.
4. Working hours shall be as required and approved by the Owner. Asbestos abatement activities including, but not limited to, work area preparation, gross removal activities, cleaning activities, waste removal, etc. may need to be performed during ‘off-hours’ (including nights and weekends). In addition, multiple mobilizations may be required to perform the work identified in this project. The Contractor shall coordinate and schedule all Work with the facility and Owner’s representative.
5. The Contractor shall prepare and coordinate with facility representative the posting of appropriate signage at the entranceway that redirects park occupants away from the area of the abatement.
6. The Contractor shall use barrier tape to extend the limits of the active, regulated work areas closed to the public and other non-abatement trades.
7. The Contractor shall be responsible for defining and coordinating the phases of the abatement with the facility and DPW, as well as securing any site specific variances, permits, and any necessary NYS DOL approvals.
8. The asbestos abatement Contractor shall coordinate locations of decontamination units, routes of egress, temporary water and power connections and waste container locations with the Owner and the Facility.
9. The Contractor may need to supply temporary power/water sources if they cannot be provided by facility.

CONTRACT No 22-523
DIVISION 2 - EXISTING CONDITIONS

10. The General Contractor shall supply any and all scaffolding for the work area(s) under this contract. Scaffolding structure and maintenance shall be in strict accordance with local, state and federal safety requirements.
11. The Contractor is to protect any and all exposed surfaces not targeted for abatement.
12. The Contractor shall request and receive in writing prior to preceding with any work info from the owner regarding surfaces/materials that require protection.
13. Regular waste generated by the abatement work of this contract shall be stored securely using a closed waste container.

1.3 PERMITS AND COMPLIANCE

- A. The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local laws, rules, and regulations pertaining to Work practices, protection of Workers, authorized visitors to the site, persons, and property adjacent to the Work.
- B. Perform asbestos related Work in accordance with New York State Industrial Code Rule 56 (herein referred to as Code Rule 56), 40 CFR 61, and 29 CFR 1926. Where more stringent requirements are specified, adhere to the more stringent requirements.
- C. The Contractor must maintain current licenses, permits and certifications pursuant to New York State Department of Labor and Department of Environmental Conservation for all Work related to this Project, including the removal, handling, transport, and disposal of asbestos containing materials.
- D. The Contractor must have and submit proof upon request that any persons employed by the Contractor to engage in or supervise Work on any asbestos Project have a valid NYS asbestos handling certificate pursuant to Code Rule 56.
- E. The Contractor shall comply fully with any Variance secured from regulatory agencies by the Owner in the performance of the Work. Any Variance applications previously submitted are included as an appendix of this specification.
- F. The Contractor shall be responsible for obtaining all other Variances as may be required for the Project or as requested by the Owner. Approval of the Owner is required prior to submission of a Variance application to any regulatory agency. Failure to obtain Owner approval may result in Owner not permitting variance to be used on the project.
- G. The Contractor shall be responsible for compliance with The New York State Uniform Fire Prevention and Building Code, or its successor during all Work at the site.
- H. Failure to adhere to the Project Documents shall constitute a breach of the Contract and the Owner shall have the right to and may terminate the Contract provided, however, the failure of the Owner to so terminate shall not relieve the Contractor from future compliance.

1.4 SUBMITTALS

CONTRACT No 22-523
DIVISION 2 - EXISTING CONDITIONS

- A. Pre-Work Submittals: Within 7 days prior to the pre-construction conference, the Contractor shall submit 3 copies of the documents listed below, with one copy going directly to the DPW Environmental Consultant for review and approval prior to the commencement of asbestos abatement activities:
1. Contractor license issued by New York State Department of Labor.
 2. Progress Schedule: Show the dates for the beginning and completion of each major element of Work including substantial completion dates for each Work Area or phase.
 3. Project Notifications: As required by Federal and State regulatory agencies together with proof of transmittal (i.e. certified mail return receipt).
 4. Building Occupant Notification: As required by regulatory agencies.
 5. Abatement Work Plan: Provide plans that clearly indicate the following:
 - a. All Work Areas/containments numbered sequentially.
 - b. Locations and types of all decontamination enclosures.
 - c. Entrances and exits to the Work Areas/containments.
 - d. Type of abatement activity/technique for each Work Area/containment.
 - e. Number and location of negative air units and exhaust. Also provide calculations for determining number of negative air pressure units.
 - f. Location of water and electrical connections to building services.
 - g. Waste transport routes through the building to the waste storage container.
 6. Disposal Site/Landfill Permit from applicable regulatory agency.
 7. NYS Department of Environmental Conservation Waste Transporter Permit.
- B. On-Site Submittals: Refer to Part 3.01.C & D for all submittals, documentation, and postings required to be maintained on-site during abatement activities.
- C. Project Close-out Submittals: Within 30 days of the completion of each abatement phase, the Contractor shall submit one hard copy of the documents listed below to the environmental consultant for review and approval prior to Contractor's final payment. Once DPW Environmental Consultant approves the close-out submittal, the Contractor shall provide three sets of the approved close-out documents (double-sided and bound) to DPW Project Management, including one set to be distributed to the facility.
1. All waste disposal manifests and disposal logs (Original waste manifests shall be sent to DPW Environmental Consultant).
 2. OSHA compliance air monitoring records conducted during the Work.
 3. Daily progress log, including the entry/exit log.
 4. Provide the Contractor's Acknowledgement Statement (Appendix B) that lists all Workers used in the performance of the Project, including name and NYS DOL certification number. The Statement shall be notarized (Original notarized statement shall be sent to DPW Environmental Consultant).
 5. Disposal Site/Landfill Permit from applicable regulatory agency.
 6. Project notifications, amended notifications, Variances.

1.5 PRE-CONSTRUCTION CONFERENCE

- A. Prior to start of preparatory Work under this Contract, the Contractor shall attend a pre-construction conference attended by Owner, Facility Personnel, and Environmental Consultant.
- B. Agenda for this conference shall include but not necessarily be limited to:

CONTRACT No 22-523
DIVISION 2 - EXISTING CONDITIONS

1. Contractor's scope of Work, Work plan, and schedule to include number of workers and shifts.
 2. Contractor's safety and health precautions including protective clothing and equipment and decontamination procedures.
 3. Environmental Consultant's duties, functions, and authority.
 4. Contractor's Work procedures including:
 - a. Methods of job site preparation and removal methods.
 - b. Respiratory protection.
 - c. Disposal procedures.
 - d. Cleanup procedures.
 - e. Fire exits and emergency procedures.
 5. Contractor's required pre-work and on-site submittals, documentation, and postings.
 6. Contractor's plan for twenty-four (24) hour Project security both for prevention of theft and for barring entry of unauthorized personnel into Work Areas.
 7. Temporary utilities.
 8. Handling of furniture and other moveable objects.
 9. Storage of removed asbestos containing materials.
 10. Waste disposal requirements and procedures, including use of the Owner supplied waste manifest.
- C. In conjunction with the conference the Contractor shall accompany the Owner and Environmental Consultant on a pre-construction walk-through documenting existing condition of finishes and furnishings, reviewing overall Work plan, location of fire exits, fire protection equipment, water supply and temporary electric tie-in.

1.6 APPLICABLE STANDARDS AND REGULATIONS

- A. The Contractor shall comply with the following codes and standards, except where more stringent requirements are shown or specified:
- B. Federal Regulations:
1. 29 CFR 1910.1001, "Asbestos" (OSHA)
 2. 29 CFR 1910.1200, "Hazard Communication" (OSHA)
 3. 29 CFR 1910.134, "Respiratory Protection" (OSHA)
 4. 29 CFR 1910.145, "Specification for Accident Prevention Signs and Tags" (OSHA)
 5. 29 CFR 1926, "Construction Industry" (OSHA)
 6. 29 CFR 1926.1101, "Asbestos, Tremolite, Anthophyllite, and Actinolite" (OSHA)
 7. 29 CFR 1926.500 "Guardrails, Handrails and Covers" (OSHA)
 8. 40 CFR 61, Subpart A, "General Provisions" (EPA)
 9. 40 CFR 61, Subpart M, "National Emission Standard for Asbestos" (EPA)
 10. 49 CFR 171-172, Transportation Standards (DOT)
- C. New York State Regulations:
1. 12 NYCRR, Part 56, "Asbestos", Industrial Code Rule 56 (DOL)
 2. 6 NYCRR, Parts 360, 364, Disposal and Transportation (DEC)
 3. 10 NYCRR, Part 73, "Asbestos Safety Program Requirements" (DOH)
- D. Standards and Guidance Documents:

CONTRACT No 22-523
DIVISION 2 - EXISTING CONDITIONS

1. American National Standard Institute (ANSI) Z88.2-80, Practices for Respiratory Protection
2. ANSI Z9.2-79, Fundamentals Governing the Design and Operation of Local Exhaust Systems
3. EPA 560/585-024, Guidance for Controlling Asbestos Containing Materials in Buildings (Purple Book)
4. EPA 530-SW-85-007, Asbestos Waste Management Guidance
5. ASTM Standard E1368 "Standard Practice for Visual Inspection of Asbestos Abatement Projects."

1.7 NOTICES

- A. The Contractor shall provide notification of intent to commence asbestos abatement activities as indicated below.
 1. At least ten (10) Working days prior to beginning abatement activities, send written notification to:
U.S. Environmental Protection Agency
National Emissions Standards for Hazardous Air Pollutants (NESHAPS) Coordinator
26 Federal Plaza
New York, NY 10007
 2. At least ten (10) days prior to beginning abatement activities send written notification to:
New York State Department of Labor
Division of Safety and Health, Asbestos Control Program.
State Office Campus
Building 12 - Room 161B
Albany, NY 12240
- B. The Contractor is required to send notifications to regulatory agencies via electronic, mail, or package delivery service that will provide proof of delivery and receipt.
- C. The Contractor shall be responsible for maintaining current project filings with regulatory agencies for the duration of the project.
- D. The Contractor shall post and/or provide Building Occupant Notification at least 10 days prior to beginning abatement activities as required by Code Rule 56.

1.8 PROJECT MONITORING AND AIR SAMPLING

- A. The Owner shall engage the services of an Environmental Consultant (the Consultant) who shall serve as the Owner's Representative in regard to the performance of the asbestos abatement Project and provide direction as required throughout the entire abatement Project period. The consultant and all sub-consultants shall not have any contractual relationship with the Contractor for the duration of the asbestos project.
- B. The Contractor is required to ensure cooperation of its personnel with the Consultant for the air sampling and Project monitoring functions described in this section. The Contractor shall comply with all direction given by the Consultant during the course of the Project.
- C. The Consultant shall provide the following administrative services:

CONTRACT No 22-523
DIVISION 2 - EXISTING CONDITIONS

1. Review and approve or disapprove all submittals, shop drawings, schedules, and samples.
 2. Assure that all notifications to governmental agencies by the Contractor are submitted in a timely manner and are correct in content.
- D. The Consultant shall staff the Project with a trained and certified person(s) to act on the Owner's behalf at the job site. This individual shall be designated as the Abatement Project Monitor (APM).
1. The APM shall be on-site at all times the Contractor is on-site. The Contractor shall not be permitted to conduct any Work unless the APM is on-site (except for inspection of barriers and negative air system during non-working days).
 2. The APM shall have the authority to direct the actions of the Contractor verbally and in writing to ensure compliance with the Project documents and all regulations. The APM shall have the authority to Stop Work when gross Work practice deficiencies or unsafe practices are observed, or when ambient fiber concentrations outside the removal area exceed 0.01 f/cc or background level.
 - a. Such Stop Work order shall be effective immediately and remain in effect until corrective measures have been taken and the situation has been corrected.
 - b. Standby time and air sample collection and analysis required to resolve the situation shall be at the Contractor's expense.
 3. The APM shall provide the following services:
 - a. Inspection of the Contractor's Work, practices, and procedures, including temporary protection requirements, for compliance with all regulations and Project specifications.
 - b. Provide abatement Project air sampling as required by applicable regulations (NYS, AHERA) and the Owner. Sampling will include, but not be limited to background, work area preparation, asbestos handling, final cleaning, and clearance air sampling.
 - c. Verify daily that all Workers used in the performance of the Project are certified by the appropriate regulatory agency.
 - d. Monitor the progress of the Contractor's Work, and report any deviations from the schedule to the Owner.
 - e. Monitor, verify, and document all waste load-out operations including placement of generator and location labels on each waste container, as required by federal regulations.
 - f. Verify that the Contractor is performing personal air monitoring daily, and that results are being returned and posted at the site as required.
 - g. The APM shall maintain a log on site that documents all project related and Consultant and Contractor actions, activities, and occurrences.
 - h. Verify landfill to be used for waste disposal with waste transporter (driver) and Contractor prior to waste trailer/dumpster leaving site. Confirm the waste transporter firm and landfill are listed on the regulatory notifications for the project and the waste transport vehicle license number is listed on the current NYS DEC Waste Transporter permit.
 4. The following minimum inspections shall be conducted by the APM accompanied by the Contractor's supervisor. Additional inspections shall be conducted as required by Project conditions and/or the Owner's direction. Progression from one phase of Work to the next by the Contractor is only permitted with the written approval of the APM.

CONTRACT No 22-523
DIVISION 2 - EXISTING CONDITIONS

- a. Pre-Construction Inspection: The purpose of this inspection is to verify the existing conditions of the Work Areas and to document these conditions.
 - b. Pre-Commencement Inspection: The purpose of this inspection is to verify the integrity of each containment system prior to disturbance of any asbestos containing material. This inspection shall take place only after the Work Area is fully prepped for removal.
 - c. Work Inspections: The purpose of this inspection is to monitor the Work practices and procedures employed on the Project and to monitor the continued integrity of the containment system. Inspections within the removal areas shall be conducted by the APM during all preparation, removal, and cleaning activities at least twice every Work shift. Additional inspections shall be conducted as warranted.
 - d. Pre-Encapsulation Inspection: The purpose of this inspection is to ensure the complete removal of Asbestos Containing Material (ACM), from all surfaces in the Work Area prior to encapsulation.
 - e. Visual Clearance Inspection: The purpose of this inspection is to verify that: all materials in the scope of work have been properly removed; no visible asbestos debris/residue remains; no pools of liquid or condensation remains; and all required cleanings are complete. This inspection shall be conducted before final air clearance testing.
 - f. Post-Clearance Inspection: The purpose of this inspection is to ensure the complete removal of ACM, including debris, from the Work Area after satisfactory final clearance sampling and removal of all isolation and critical barriers and equipment from the Work Area.
 - g. Punch List Inspection: The purpose of this inspection is to verify the Contractor's certification that all Work has been completed as contracted and the existing condition of the area prior to its release to the Owner.
- E. The Consultant shall provide abatement Project air sampling and analysis as required by applicable regulations (New York State and/or AHERA). Sampling will include but is not limited to, background, work area preparation, asbestos handling, and final cleaning and clearance air sampling.
1. Unless otherwise required by applicable regulations, the Consultant shall have samples analyzed by Phase Contrast Microscopy (PCM). Results shall be available within 24 hours of completion of sampling.
 2. Samples shall be collected as required by applicable regulations (New York State and/or AHERA) and these specifications. If Transmission Electron Microscopy (TEM) clearance air sampling is utilized by the owner, the clearance criteria and sampling protocols must be in compliance with AHERA. If PCM air sample analysis results exceed the satisfactory clearance criteria, then TEM analysis of the entire set of clearance air samples may be used, provided that a standard NIOSH/ELAP accepted laboratory analysis method is utilized that shall report each air sample result in fibers per cubic centimeter.
 3. If the air sampling during any phase of the abatement project reveals airborne fiber levels at or above .01 fibers/cc or the established background level, whichever is greater, outside the regulated Work Area, Work shall stop immediately and corrective measures required by Code Rule 56 shall be initiated. Notify DPW project personnel as well as all employers and occupants in adjacent areas. The Contractor shall bear the burden of any and all costs incurred by this delay.

4. The Environmental Consultant shall submit copies of all elevated air sampling results collected during abatement and all elevated final air clearance results to the Commissioner of Labor, as required by regulation.

1.9 CONTRACTOR AIR SAMPLING

- A. In addition to the requirements of OSHA 1926.1101, the Contractor shall be required to perform personal air monitoring every Work shift in each Work Area during which abatement activities occur in order to determine that appropriate respiratory protection is being worn and utilized.
- B. The Contractor shall conduct air sampling that is representative of both the 8-hour time weighted average and 30-minute short-term exposures to indicate compliance with the permissible exposure and excursion limits.
- C. The Contractor's laboratory analysis of air samples shall be conducted by an NYS DOH ELAP approved laboratory. The Consultant shall not collect or analyze the Contractor's air samples.
- D. Results of personnel air sample analyses shall be available, verbally, within twenty-four (24) hours of sampling and shall be posted upon receipt. Written laboratory reports shall be delivered and posted at the Work site within five (5) days. Failure to comply with these requirements may result in all work being stopped until compliance is achieved.

1.10 PROJECT SUPERVISOR

- A. The Contractor shall designate a full-time Project Supervisor who shall meet the following qualifications:
 1. The Project Supervisor shall hold New York State certification as an Asbestos Supervisor.
 2. The Project Supervisor shall meet the requirements of a "Competent Person" as defined by OSHA 1926.1101 and shall have a minimum of one year experience as a supervisor.
 3. The Project Supervisor must be able to speak, read, and write English fluently, as well as communicate in the primary language of the Workers.
- B. If the Project Supervisor is not on-site at any time whatsoever, all Work shall be stopped. The Project Supervisor shall remain on-site until the Project is complete. The Contractor may not remove the Project Supervisor from the Project without the written consent of the Owner and the Environmental Consultant; however the Project Supervisor shall be removed from the Project if so requested by the Owner.
- C. The Project Supervisor shall maintain the Daily Project Log and the entry/exit logs as required by New York State Department of Labor and section 2.03 of the specifications and the Waste Disposal Log (Appendix A) required by section 4.03 of the specifications.
- D. The Project Supervisor shall be responsible for the performance of the Work and shall represent the Contractor in all respects at the Project site. The Supervisor shall be the primary point of contact for the Asbestos Project Monitor.

1.11 MEDICAL REQUIREMENTS

- A. Before exposure to airborne asbestos fibers, provide Workers with a comprehensive medical examination as required by 29 CFR 1910.1001, and 29 CFR 1926.1101.
 - 1. This examination is not required if adequate records show the employee has been examined as required by 29 CFR 1910.1001, and 29 CFR 1926.1101 within the past year.
 - 2. The same medical examination shall be given on an annual basis to employees engaged in an occupation involving potential disturbance of asbestos fibers.

1.12 TRAINING

- A. As required by applicable regulations, prior to assignment to asbestos Work instruct each employee with regard to the hazards of asbestos, safety and health precautions, and the use and requirements of protective clothing and equipment.
- B. Establish a respirator program as required by ANSI Z88.2 and 29 CFR 1910.134, and 29 CFR 1926.1101. Provide respirator training and fit testing.

1.13 RESPIRATORY PROTECTION

- A. Select respirators from those approved by the National Institute for Occupational Safety and Health (NIOSH).
- B. Respirators shall be individually fit-tested to personnel under the direction of an Industrial Hygienist on a yearly basis. Fit-tested respirators shall be permanently marked to identify the individual fitted, and use shall be limited to that individual.
- C. Where fiber levels permit, and in compliance with regulatory requirements, Powered Air Purifying Respirators (PAPR) are the minimum allowable respiratory protection permitted to be utilized during gross removal operations of OSHA Class I or OSHA Class II friable ACM.
- D. No respirators shall be issued to personnel without such personnel participating in a respirator training program.
- E. High Efficiency Particulate Air (HEPA) respirator filters shall be approved by NIOSH and shall conform to the OSHA requirements in 29 CFR 1910.134 and 29 CFR 1926.1101.
- F. A storage area for respirators shall be provided by the Contractor in the clean room side of the personnel decontamination enclosure where they will be kept in a clean environment.
- G. The Contractor shall provide and make available a sufficient quantity of respirator filters so that filter changes can be made as necessary during the work day.
- H. Filters used with negative pressure air purifying respirators shall not be used any longer than one eight (8) hour work day. Any loose respirator filters found within the regulated area, must be disposed of as asbestos waste.
- I. Any authorized visitor, Worker, or supervisor found in the Work Area not wearing the required respiratory protection shall be removed from the Project site and not be permitted to return.

- J. The Contractor shall have at least two (2) Powered Air Purifying Respirators stored on site designated for authorized visitors use. Appropriate respirator filters for authorized visitors shall be made available by the Contractor.

1.14 DELIVERY AND STORAGE

- A. Deliver all materials to the job site in original packages with containers bearing manufacturer's name and label.
- B. Store all materials at the job site in a suitable and designated area.
 - 1. Store materials subject to deterioration or damage away from wet or damp surfaces and under cover.
 - 2. Protect materials from unintended contamination and theft.
 - 3. Storage areas shall be kept clean and organized.
- C. Remove damaged or deteriorated materials from the job site. Materials contaminated with asbestos shall be disposed of as asbestos debris as herein specified. This includes unused Contractor supplies located in the regulated work area.

1.15 TEMPORARY UTILITIES

- A. Shut down and lock out all electrical power to the asbestos Work Areas, including lighting circuits. Any electrical power passing through the Work Areas that can't be shut down due to health and safety reasons, shall be protected as per the requirements of Industrial Code Rule 56 and shall not be utilized within the work area.
- B. Provide temporary 120-240 volt, single phase, three wire, 100 amp electric service with Ground Fault Circuit Interrupters (GFCI) for all electric requirements within the asbestos Work Area.
 - 1. Where available, obtain from Owner's existing system. Otherwise provide power from other sources (i.e. generator).
 - 2. Provide temporary wiring and "weatherproof" receptacles in sufficient quantity and location to serve all HEPA equipment and tools.
 - 3. Provide wiring and receptacles as required by the Environmental Consultant for air sampling equipment (pumps, fans, leaf blowers, etc.).
 - 4. All power to the Work Area shall be brought in from outside the area through GFCI's at the source.
- C. Provide temporary lighting with "weatherproof" fixtures for all Work Areas including decontamination chambers.
 - 1. The entire Work Area shall be kept illuminated at all times.
 - 2. Provide lighting as required by the Environmental Consultant for the purposes of performing required inspections.
- D. All temporary devices and wiring used in the Work Area shall be capable of decontamination procedures including HEPA vacuuming and wet-wiping.
- E. Utilize domestic water service, if available, from Owner's existing system. Provide hot water heaters with sufficient capacity to meet Project demands.

PART 2 PRODUCTS

2.1 PROTECTIVE CLOTHING

- A. Provide personnel utilized during the Project with disposable protective whole body clothing, head coverings, gloves and foot coverings. Provide disposable plastic or rubber gloves to protect hands. Cloth gloves may be worn inside the plastic or rubber for comfort, but shall not be used alone. Make sleeves secure at the wrists and make foot coverings secure at the ankles by the use of tape, or provide disposable coverings with elastic wrists or tops.
- B. Provide sufficient quantities of protective clothing to assure a minimum of four (4) complete disposable outfits per day for each individual performing abatement Work.
- C. Eye protection and hard hats shall be provided and made available for all personnel entering any Work Area.
- D. Authorized visitors shall be provided with suitable protective clothing, headgear, eye protection, and footwear whenever they enter the Work Area.

2.2 SIGNS AND LABELS

- A. Provide warning signs and barrier tapes at all approaches to asbestos Work Areas. Locate signs at such distance that personnel may read the sign and take the necessary protective steps required before entering the area.
 - 1. Provide danger signs in vertical format conforming to 29 CFR 1926.1101, minimum 20" x 14" displaying the following legend.

DANGER
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
AUTHORIZED PERSONNEL ONLY
WEAR RESPIRATORY PROTECTION AND
PROTECTIVE CLOTHING IN THIS AREA
 - 2. Provide 3" wide yellow barrier tape printed with black lettered, "DANGER ASBESTOS REMOVAL". Locate barrier tape across all corridors, entrances and access routes to asbestos Work Area. Install tape 3' to 4' AFF.
- B. Provide asbestos danger labels affixed to all asbestos materials, scrap, waste, debris and other products contaminated with asbestos.
 - 1. Provide asbestos danger labels of sufficient size to be clearly legible, displaying the following legend:

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATHE DUST

AVOID CREATING DUST

2. Provide the following asbestos labels, of sufficient size to be clearly legible, for display on waste containers (bags or drums) which will be used to transport asbestos contaminated material in accordance with United States Department of Transportation 49 CFR Parts 171 and 172: (Note: Include "RQ" for friable asbestos waste only.)
RQ, NA2212, (WASTE) ASBESTOS, 9, PGIII

3. Generator identification information shall be affixed to each waste container or any packaging used to containerize asbestos waste indicating the following printed in indelible ink:

Generator Name
Facility Name
Facility Address
Date

2.3 DAILY PROJECT LOG & WORK AREA ENTRY/EXIT LOG

- A. Provide a bound Daily Project Log. The log shall contain on title page the Project name; name, address and phone number of Owner; name, address and phone number of Environmental Consultant; name, address and phone number of Abatement Contractor; emergency numbers including, but not limited to local Fire/Rescue department and all other New York State Department of Labor requirements.
- B. 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.
- C. All persons entering and exiting the Work Area shall sign the log and include name, certification number, and time.
- D. The Project Supervisor shall document all Work performed daily and note all inspections required by Code Rule 56, i.e. testing and inspection of barriers and enclosures.

2.4 SCAFFOLDING AND LADDERS

- A. Provide all scaffolding and/or staging as necessary to accomplish the Work of this Contract. Scaffolding may be of suspension type or standing type such as metal tube and coupler, tubular welded frame, pole or outrigger type or cantilever type. The type, erection and use of all scaffolding and ladders shall comply with all applicable OSHA construction industry standards.
- B. Provide scaffolding and ladders as required by the Environmental Consultant for the purposes of performing required inspections.

2.5 SURFACTANT (AMENDED WATER)

- A. Wet all asbestos-containing materials prior to removal with surfactant mixed and applied in accordance with manufacturer's printed instructions.

2.6 ENCAPSULANT

- A. Encapsulant shall be tinted or pigmented so that application when dry is readily discernible.
- B. The encapsulant solvent or vehicle shall not contain a volatile hydrocarbon.

2.7 WASTE DISPOSAL BAGS, DRUMS, AND CONTAINERS

- A. Provide 6 mil polyethylene disposal bags printed with asbestos caution labels. Bags shall also be imprinted with U.S. Department of Transportation required markings.
- B. Provide 30 or 55 gallon capacity fiber, plastic, or metal drums capable of being sealed air and water tight if asbestos waste has the potential to damage or puncture disposal bags. Affix asbestos caution labels on lids and at one-third points around drum circumference to assure ready identification.
- C. Containers and bags must be labeled accordance with 40 CFR Part 61 NESHAPS and Code Rule 56. When the bags/containers are moved to the holding area, lockable trailer, or lockable hardtop dumpster from the waste decontamination system washroom, each bag/container must also be appropriately labeled with the date moved in waterproof markings.
- D. Labeled ACM waste containers or bags shall not be used for non-ACM waste or trash. Any material placed in labeled containers or bags, whether turned inside out or not shall be handled and disposed of as ACM waste.

2.8 HEPA VACUUM EQUIPMENT

- A. All dry vacuuming performed under this contract shall be performed with High Efficiency Particulate Absolute (HEPA) filter equipped industrial vacuums conforming to ANSI Z9.2.

2.9 POWER TOOLS

- A. Any power tools used to drill, cut into, or otherwise disturb asbestos material shall be manufacturer equipped with HEPA filtered local exhaust ventilation.

2.10 POLYETHYLENE SHEETING

- A. All polyethylene (plastic) sheeting used on the Project (including but not limited to sheeting used for critical and isolation barriers, fixed objects, walls, floors, ceilings, waste container) shall be at least 6 mil fire retardant sheeting.
- B. Decontamination enclosure systems shall utilize at least 6 mil opaque fire retardant plastic sheeting. At least 2 layers of 6 mil reinforced fire retardant plastic sheeting shall be used for the flooring.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Should visible emissions or water leaks be observed outside the Work Area, immediately stop Work and institute emergency procedures per Code Rule 56. Should there be elevated fiber levels outside the Work Area, immediately stop Work, institute emergency procedures per Code Rule 56, and notify all employers and occupants in adjacent areas. All costs incurred in decontaminating such non-Work Areas and the contents thereof shall be borne by the Contractor, at no additional cost to the Owner.
- B. Valid NYS DOL Asbestos Handler certification cards shall be on site prior to admittance of any Contractor's employees to the asbestos Work Area.
- C. The following submittals, documentation, and postings shall be maintained on-site by the Contractor during abatement activities at a location approved by the Abatement Project Monitor:
 - 1. Valid Contractor license issued by New York State Department of Labor.
 - 2. NYS DOL Asbestos Handler certification cards for each person employed in the removal, handling, or disturbance of asbestos.
 - 3. Daily OSHA personal air monitoring results.
 - 4. NYS Department of Health ELAP certification for the laboratory that will be analyzing the OSHA personnel air samples.
 - 5. NYS Department of Environmental Conservation Waste Transporter Permit.
 - 6. Project documents (specifications and drawings.)
 - 7. Notifications, Variances, Approved Work Plan. Ensure that the most up-to-date notifications and Variances are on-site.
 - 8. Applicable regulations.
 - 9. Safety Data Sheets of supplies/chemicals used on the Project.
 - 10. Disposal Site/Landfill Permit from applicable regulatory agency.
 - 11. List of emergency telephone numbers.
 - 12. Magnahelic manometer semi-annual calibration certification.
 - 13. Waste Disposal Log.
 - 14. Daily Project Log.
 - 15. Entry/Exit Logs
- D. The following documentation shall be maintained on-site by the Abatement Project Monitor during abatement activities:
 - 1. Valid Contractor license issued by New York State Department of Labor.
 - 2. Air Sample Log.
 - 3. Air sample results.
 - 4. Project Monitor Daily Log
 - 5. Asbestos Survey Report.
 - 6. A copy of ASTM Standard E1368 "Standard Practice for Visual Inspection of Asbestos Abatement Projects."
 - 7. Calibration chart for rotameter(s) used on-site.
- E. The Work Area must be vacated by building occupants prior to decontamination enclosure construction and Work Area preparation.

- F. All demolition necessary to access asbestos containing materials for removal must be conducted within negative pressure enclosures by licensed asbestos handlers. Demolition debris may be disposed of as construction and demolition debris provided the Abatement Project Monitor determines that it is not contaminated with asbestos and there has been no disturbance of ACM within the enclosure. If the demolition debris is determined to be contaminated or ACM has been disturbed, it must be disposed of as asbestos waste.

3.2 PERSONNEL DECONTAMINATION ENCLOSURE

- A. Provide personnel decontamination enclosure contiguous to the Work Area or as per Variance. The decontamination enclosure shall be attached to the Work Area and not located within it unless isolation barriers are installed. If the decontamination chamber is accessible to the public it shall be fully framed, sheathed, and lockable to prevent unauthorized entry.
- B. Access to the Work Area will be from the clean room through an air-lock to the shower and through an air lock to the equipment room. Each airlock shall be a minimum of three feet from door to door. Additional air locks shall be provided as required by Code Rule 56 for remote decontamination enclosures.
- C. The decontamination enclosure ceiling and walls shall be covered with one layer of opaque 6 mil polyethylene sheeting. Two layers of reinforced polyethylene sheeting shall be used to cover the floor.
- D. The entrance to the clean room shall have a lockable door with adequate small openings for Work Area make-up air. Provide suitable lockers for storage of Worker's street clothes. Storage for respirators along with replacement filters and disposable towels shall also be provided.
- E. Provide a temporary shower with individual hot and cold water supplies and faucets. Provide a sufficient supply of soap and shampoo. There shall be one shower for every six Workers. The shower room shall be constructed in such a way so that travel through the shower chamber shall be through the shower. The shower shall not be able to be bypassed.
- F. Shower water shall be drained, collected and filtered through a system with at least a 5.0 micron particle size collection capability containing a series of several filters with progressively smaller pore sizes to avoid rapid clogging of the system. The filtered waste water shall then be discharged in accordance with applicable codes and the contaminated filters disposed of as asbestos waste.
- G. The equipment room shall be used for the storage of tools and equipment. A walk-off pan filled with water shall be located in the Work Area outside the equipment room for Workers to clean foot coverings when leaving the Work Area. A labeled 6 mil plastic ACM waste bag for collection of contaminated clothing shall be located in this room.
- H. The personal decontamination enclosure shall be cleaned and disinfected minimally at the end of each Work shift and as otherwise directed by the Asbestos Project Monitor.

3.3 WASTE DECONTAMINATION ENCLOSURE

- A. Provide a waste decontamination enclosure contiguous to the Work area. The decontamination enclosure shall be attached to the Work Area and not located within it unless isolation barriers are installed. If the decontamination chamber is accessible to the public it shall be fully framed, sheathed, and lockable to prevent unauthorized entry.
- B. The waste decontamination enclosure system shall consist of a holding area, air lock and washroom. The airlock shall be a minimum of three feet from door to door. The entrance to the holding area shall have a lockable door.
- C. The decontamination enclosure ceiling and walls shall be covered with one layer of opaque 6 mil polyethylene sheeting on walls and ceiling. Two layers of reinforced polyethylene sheeting shall be used to cover the floor.
- D. Where there is only one egress from the Work Area, the holding area of the waste decontamination enclosure system may branch off from the personnel decontamination enclosure equipment room, which then serves as the waste wash room.
- E. The waste wash room water shall be drained, collected, and filtered through a system with at least a 5.0 micron particle size collection capability containing a series of several filters with progressively smaller pore sizes to avoid rapid clogging of the system. The filtered waste water shall then be discharged in accordance with applicable codes and the contaminated filters disposed of as asbestos waste.
- F. In small asbestos Projects where only one egress from the Work Area exists, the shower room may be used as a waste washroom. In this instance, the clean room shall not be used for waste storage, but shall be used for waste transfer to carts, which shall immediately be removed from this enclosure.

3.4 WORK AREA ENTRY AND EXIT PROCEDURES

- A. Access to and from the asbestos Work Area is permitted only through the personnel decontamination enclosure unless otherwise stipulated in a Site Specific Variance.
- B. Workers shall sign the entry/exit log upon every entry and exit.
- C. The following procedures shall be followed when entering the Work Area:
 - 1. Before entering the Work Area, Workers shall proceed to the clean room, remove all street clothes, and don protective clothing, equipment, and respirators.
 - 2. Workers shall proceed from the clean room through the shower room and the equipment room and into the Work Area.
- D. The following procedures shall be followed when exiting the Work Area:
 - 1. Before leaving the Work Area, gross asbestos contamination will be removed by brushing, wet cleaning and/or HEPA vacuuming, followed by use of the walk-off pan.
 - 2. In the equipment room, Workers shall remove disposable clothing, but not respirators, and shall place clothing in plastic disposal bags for disposal as contaminated debris prior

- to entering the shower room. Reusable equipment shall be removed and stored in the equipment room (e.g. work boots).
3. Workers shall shower thoroughly while wearing respirators, then wash respirator with soap and water prior to removal.
 4. Upon exiting the shower, Workers shall enter the clean room and don new disposable clothing if the Work shift is to continue or street clothes to exit area. Under no circumstances shall Workers enter public non-Work Areas in disposable protective clothing.
- E. If remote decontamination enclosures are permitted by Code Rule 56 or a Site Specific Variance, workers shall wear two disposable suits for all phases of Work. Workers exiting the work area shall HEPA vacuum the outer suit, enter the airlock, remove the outer suit and then place it back into the Work Area. A clean second suit shall be donned before exiting the airlock and proceeding to the decontamination enclosure or another work area via the designated pathway required by Code Rule 56.

3.5 WORK AREA PREPARATION

- A. Asbestos danger signs shall be posted at all approaches to the asbestos Work Area. Post all emergency exits as emergency exits only on the Work Area side, post with asbestos caution signs on the non-Work Area side. Provide all non-Work Area stairs and corridors accessible to the asbestos Work Area with warning tapes at the base of stairs and beginning of corridors. Warning tapes shall be in addition to caution signs.
- B. Shut down and lock out the building heating, ventilating, and air conditioning systems. Electrical systems and circuits shall also be shut down unless permitted to remain active per Code Rule 56 and appropriately protected and labeled. Existing lighting sources shall not be utilized. Provide temporary electric power and lighting as specified herein.
- C. All non-ACM surfaces and objects within the Work Area shall be pre-cleaned using HEPA vacuuming and/or wet-wiping methods. Dry sweeping and any other methods that raise dust shall be prohibited. ACM shall not be disturbed during pre-cleaning.
- D. Movable objects within the Work Area shall be HEPA vacuumed and/or wet-wiped and removed from the Work Area.
- E. All non-movable equipment in the Work Area shall be completely covered with 2 layers of polyethylene sheeting, at least 6 mil in thickness, and secured in place with duct tape and/or spray adhesive. Active Fire Protection System components in the Work Area shall not be covered with fire retardant plastic sheeting or any other obstruction.
- F. Provide enclosure of the asbestos Work Area necessary to isolate it from unsealed areas of the building in accordance with the approved asbestos Work plan and as specified herein.
- G. Provide critical barriers by sealing off all openings including but not limited to operable windows and skylights, doorways, diffusers, grills, electrical outlets and boxes, doors, floor drains, and any other penetrations to surfaces in the Work Area enclosure, using 2 layers of at least 6 mil fire retardant plastic sheeting.

CONTRACT No 22-523
DIVISION 2 - EXISTING CONDITIONS

- H. Provide isolation barriers by installing temporary framing and sheathing at openings larger than 32 square feet forming the limits of the asbestos Work Area. Sheathing thickness must be a minimum of 3/8 inch and all sheathing shall be caulked and the Work Area side sealed with two layers of 6 mil fire retardant plastic sheeting. Isolation barriers in stairwells and at work area egress locations shall not be covered with sheathing, only two layers of 6 mil fire retardant plastic sheeting.
- I. Isolation barriers shall be installed at all elevator openings in the Work Area. Elevators running through the regulated abatement work area shall be shut down or isolated as per Code Rule 56. Elevator controls shall be modified so that elevators bypass the Work Area
- J. Provide two independent layers of 6 mil fire retardant plastic sheeting over all floor, wall, and ceiling surfaces. Isolation barriers shall also be covered with two independent layers (for a total of four layers). Sheeting shall be secured with duct tape. All joints in polyethylene sheeting shall overlap 12" minimum. Carpeting left in place shall be covered with 3/8 inch plywood sheathing prior to plasticizing.
- K. Unless otherwise specified for removal, the Contractor shall either protect all fiberglass insulation on piping, ductwork, tanks, etc. in the Work Area using two layers of six mil fire retardant plastic or remove the insulation as asbestos containing waste.
- L. Frame out emergency exits from Work Area. Provide double layer 6 mil polyethylene sheeting and tape seal opening. Post as emergency exits only and tape utility knife to Work Area side of each exit. Within the Work Area, mark the locations and directions of emergency exits throughout the Work Area using exit signs and/or duct tape.
- M. Remove all items attached to or in contact with ACM only after the Work Area enclosure is in place. HEPA vacuum and wet wipe with amended water all removed items prior to their removal from the Work Area and before the start of asbestos removal operations.
- N. Suspended ceiling tiles shall only be removed after Work Area preparation is complete. If possible, non-contaminated ceiling tiles shall be HEPA vacuumed and removed from the Work Area before asbestos removals begin. Contaminated ceiling tiles shall be disposed of as asbestos waste.

3.6 NEGATIVE AIR PRESSURE FILTRATION SYSTEM

- A. Provide a portable asbestos filtration system that develops a minimum pressure differential of negative 0.02 in. of water column within all full enclosure areas relative to adjacent unsealed areas and that provides a minimum of 4 air changes per hour in the Work Area during abatement and 6 air changes for non-friable flooring and/or mastic removal.
- B. Such filtration systems must be made operational after critical and isolation barriers are installed but before wall, floor, and ceilings are plasticized and shall be operated 24 hours per day during the entire Project until the final cleanup is completed and satisfactory results of the final air samples are received from the laboratory.
- C. The system shall include a series of pre-filters and filters to provide High Efficiency Particulate Air (HEPA) filtration of particles down to 0.3 microns at 100% efficiency and below 0.3

CONTRACT No 22-523
DIVISION 2 - EXISTING CONDITIONS

microns at 99.9% efficiency. Provide sufficient replacement filters to replace pre-filters every 2 hours, secondary pre-filters every 24 hours, and primary HEPA filters every 600 hours (25 continuous days) of operation. HEPA filter sides shall be marked with installation date during all new HEPA filter installations on project.

- D. A minimum of one additional filtration unit of at least the same capacity as the primary unit(s) shall be installed and fully functional to be used during primary unit (s) filter changing and in case of primary failure.
- E. At no time will the unit exhaust indoors, within 15 feet of a receptor, including but not limited to windows and doors, or adversely affect the air intake of the building. Exhaust ducting shall not exceed 25' in length except as allowed by Industrial Code Rule 56. Provide construction fencing at ground level exhaust termination locations per Code Rule 56.
- F. Upon electric power failure or shut-down of any filtration unit, all abatement activities shall stop immediately and only resume after power is restored and all filtration units are fully operating. For shut-downs longer than one hour, all openings into the Work Area, including the decontamination enclosures, shall be sealed.
- G. For all OSHA Class I removal Work Areas, the Contractor shall provide a manometer to verify negative air pressure. Manometers shall be read twice daily and recorded within the Daily Project Log.
- H. There shall be at least a 4 hour settling period after the Work Area is fully prepared and the negative filtration units have been started to ensure integrity of the barriers.
- I. Once installed and operational, the Contractor's Supervisor shall conduct daily inspections of the Work Area to insure the airtight integrity of the enclosure and operation of the negative air system. Findings shall be recorded within the Daily Project Log. Inspections shall also be conducted on days when no abatement activities are in progress per Code Rule 56 (i.e. weekends).

3.7 REMOVAL OF ASBESTOS CONTAINING MATERIALS

- A. Asbestos-containing materials shall be removed in accordance with the Contract Documents and the approved Asbestos Work Plan. Only one type of ACM shall be abated at a time within a Work Area. Where there are multiple types of ACM requiring abatement, Code Rule 56 procedures for sequential abatement shall be followed.
- B. Sufficiently wet asbestos materials with a low pressure, airless fine spray of surfactant to ensure full penetration prior to material removal. Re-wet material that does not display evidence of saturation.
- C. One Worker shall continuously apply amended water while ACM is being removed.
- D. Perform cutting, drilling, abrading, or any penetration or disturbance of asbestos containing material in a manner to minimize the dispersal of asbestos fibers into the air. Use equipment and methods specifically designed to limit generation of airborne asbestos particles. All power

CONTRACT No 22-523
DIVISION 2 - EXISTING CONDITIONS

operated tools used shall be provided with manufacturer HEPA equipped filtered local exhaust ventilation, as required by regulation.

- E. Upon removal of ACM from the substrate, the newly exposed surfaces shall be HEPA vacuumed and/or wet cleaned. Surfaces must be thoroughly cleaned using necessary methods and any required solvents to completely remove any adhesive, mastic, etc.
- F. All removed material shall be placed into 6 mil plastic disposal bags or other suitable container upon detachment from the substrate. Cleanup of accumulations of loose debris or waste shall be performed whenever there is enough accumulation to fill a single bag or container and minimally at the end of each workshift.
- G. Large components shall be wrapped in two layers of 6 mil polyethylene sheeting. Sharp components likely to tear disposal bags shall be placed in fiber drums or boxes and then wrapped with sheeting.
- H. Power or pressure washers are not permitted for asbestos removal or clean-up procedures unless approved in a Site Specific Variance and allowed by owner.
- I. All open ends of pipe and duct insulation not scheduled for removal shall be encapsulated using lag cloth.
- J. All construction and demolition debris determined by the Environmental Consultant to be contaminated with asbestos shall be handled and disposed of as asbestos waste.
- K. The use of metal shovels, metal dust pans, etc. are not permitted inside the work area.

3.8 EQUIPMENT AND WASTE CONTAINER DECONTAMINATION AND REMOVAL PROCEDURES

- A. External surfaces of contaminated containers and equipment shall be cleaned by wet cleaning and/or HEPA vacuuming in the Work Area before moving such items into the waste decontamination enclosure system airlock by persons assigned to this duty. The persons in the Work Area shall not enter the airlock. No gross removal operations are permitted when waste transfer is in progress.
- B. The containers and equipment shall be removed from the airlock by persons stationed in the washroom during waste removal operations. The external surfaces of containers and equipment shall be cleaned a second time by wet cleaning.
- C. The cleaned containers of asbestos material and equipment are to be dried of any excessive pooled or beaded liquid, placed in uncontaminated 6 mil plastic bags or sheeting, as the item's physical characteristics demand, and sealed airtight.
- D. The clean re-containerized items shall be moved into the airlock that leads to the holding area. Workers in the washroom shall not enter this airlock.
- E. Containers and equipment shall be moved from the airlock and into the holding area by persons dressed in clean personal protective equipment, who have entered from the holding area.

- F. The cleaned containers of asbestos material and equipment shall be placed in water tight carts with doors or tops that shall be closed and secured. These carts shall be held in the holding area until transfer to the waste container. The carts shall be wet cleaned and/or HEPA vacuumed at least once each day.
- G. The exit from the decontamination enclosure system shall be secured to prevent unauthorized entry.
- H. Where the waste removal enclosure is part of the personnel decontamination enclosure, waste removal shall not occur during shift changes or when otherwise occupied. Precautions shall be taken to prevent short circuiting and cycling of air outward through the shower and clean room.

3.9 WORK AREA DECONTAMINATION, CLEANING, AND CLEARANCE PROCEDURES

- A. Following completion of gross abatement and after all accumulations of asbestos waste materials have been containerized, the following decontamination procedures shall be followed unless modified by a Site Specific Variance.
- B. First Cleaning:
 - 1. All bagged asbestos waste and unnecessary equipment shall be decontaminated and removed from the Work Area.
 - 2. All surfaces in the Work Area shall be wet cleaned except active fire protection system components that may be damaged by water. A wet-purpose shop vacuum may be used to pick up excess liquid, and may either be decontaminated prior to removal from the Work Area or disposed of as asbestos waste.
 - 3. The Abatement Project Monitor (APM) shall conduct a visual inspection of the Work Area for cleanliness and completion of abatement.
 - 4. The Contractor shall then apply a thin coat of encapsulant to all surfaces in the Work Area that were not the subject of removal. In no event shall encapsulant be applied to any surface that was the subject of removal prior to obtaining satisfactory air monitoring results. Encapsulants shall be pigmented or tinted to provide an indication for completeness of coverage. The APM shall determine adequacy of coverage.
 - 5. After the encapsulant has been applied and the required waiting/settling and drying time has elapsed, the first layer of polyethylene sheeting shall then be removed and bagged as asbestos waste.
- C. Second Cleaning
 - 1. All surfaces in the Work Area shall be HEPA vacuumed and then wet cleaned. Wet cleaning of active fire protection system components is not necessary if damage may occur.
 - 2. The APM shall conduct a second visual inspection of the Work Area for cleanliness.
 - 3. After the required waiting/settling/drying time has elapsed, the second layer of polyethylene sheeting shall be removed and bagged as asbestos waste.
- D. Third Cleaning
 - 1. All surfaces in the Work Area shall be HEPA vacuumed and then wet cleaned. Wet cleaning of active fire protection system components is not necessary if damage may occur.

CONTRACT No 22-523
DIVISION 2 - EXISTING CONDITIONS

2. After the required waiting/settling/drying time has elapsed, the APM shall conduct a third visual inspection of the Work Area for completeness of abatement and cleanliness. The APM shall document the results of the visual inspection in the Project Monitor Log and Contractor's Daily Project Log.
 3. After satisfactory APM visual inspection, aggressive final clearance air sampling shall then be conducted by the Environmental Consultant provided no visible asbestos debris/residue; pools of liquid, or condensation remains. NOTE: TEM samples should be used vs. PCM if demolition or other dust-generating evolutions are taking place in adjacent areas, as evident from excessive loading.
 4. Upon receipt of satisfactory final clearance air sampling results, the negative air pressure equipment can then be shut down and the isolation and critical barriers removed and bagged as asbestos waste. Following this and satisfactory inspections by the project supervisor and the APM for cleanliness, the decontamination enclosures shall be removed.
- E. As a result of any visual inspection by the APM or should air sampling results indicate high fiber levels, the Contractor will reclean the affected areas at no additional expense to the Owner.

3.10 TENT ENCLOSURES

- A. Tent enclosures may only be used where specifically permitted by Code Rule 56 or a Site Specific Variance issued by the NYS Department of Labor.
- B. The Contractor shall restrict access to the immediate area where tent removal procedures are taking place using barrier tape and/or construction barriers. Caution signs shall be posted.
- C. Remote personnel decontamination enclosures shall be constructed. Configuration shall be as required by Project size and a washroom with attached airlock shall be constructed contiguous to the tent enclosure for small and large size tent enclosure work areas. For tent enclosures with gross abatement of friable materials, a contiguous decontamination system shall be constructed, maintained and utilized, except for minor size tent enclosure work areas where an adjacent decontamination room/area is permitted by Code Rule 56.
- D. The Work Area shall be pre-cleaned. All objects and equipment that will remain in the restricted area during abatement shall be sealed with two layers of six mil polyethylene and tape.
- E. The tent shall be a single use barrier constructed with a rigid frame and at least two layers of six mil polyethylene unless one layer of six mil polyethylene is otherwise permitted by Code Rule 56. Tents with twenty (20) square feet or less of floor space or no gross removal of friable ACM shall be constructed of one (1) layer of six mil polyethylene and shall include walls, ceilings and a floor (except portions of walls, floors and ceilings that are the removal surface) with double folded seams. All seams shall be sealed airtight using duct tape and/or spray adhesive.
- F. The tent shall be constructed with at least one airlock for worker/waste egress.
- G. A manometer shall be used for all OSHA Class I abatement.

CONTRACT No 22-523
DIVISION 2 - EXISTING CONDITIONS

- H. Negative air shall be maintained at four (4) air changes per hour for non-friable and glovebag abatement tent enclosure work areas. Eight (8) air changes shall be maintained for friable gross removal tent enclosure work areas. In a Minor size abatement tent enclosure work area a HEPA vacuum may be used to maintain the required air changes.
- I. OSHA compliance air monitoring is required per section 1.09.
- J. ACM removal shall follow procedures defined in section 3.07.
- K. Waste material shall be placed in properly labeled 6 mil plastic bags or other appropriate containers. The outside of the bags or containers shall be wet wiped and/or HEPA vacuumed and shall then be placed in a second bag/container before being transported to the waste storage container. All transportation of waste bags and containers outside the Work Area shall be in watertight carts. These carts shall be held in the holding area until transfer to the waste container. The carts shall be wet cleaned and/or HEPA vacuumed at least once each day.
- L. Following completion of gross abatement and after all accumulations of asbestos waste materials have been containerized, the following decontamination procedures shall be followed.
 - 1. All bagged asbestos waste and unnecessary equipment shall be decontaminated and removed from the Work Area.
 - 2. All surfaces in the Work Area shall be wet cleaned. A wet-purpose shop vacuum may be used to pick up excess liquid, and shall be decontaminated prior to removal from the Work Area.
 - 3. The Contractor shall then apply a thin coat of encapsulant to all non-removal surfaces covered with plastic in the Work Area. In no event shall encapsulant be applied to any surface that was the subject of removal prior to obtaining satisfactory air monitoring results. Encapsulants shall be pigmented or tinted to provide an indication for completeness of coverage. The APM shall determine adequacy of coverage.
 - 4. After the waiting/settling/drying time requirements have elapsed, the Asbestos Project Monitor shall conduct a visual inspection of the Work Area for cleanliness and completion of abatement. The APM shall document the results of the visual inspection in the Project Monitor Log and Contractor's Daily Project Log.
 - 5. After satisfactory APM visual inspection, aggressive final clearance air sampling shall then be conducted by the Environmental Consultant.
 - 6. Upon receipt of satisfactory final clearance air sampling results, the tent shall be collapsed into itself, placed in suitable disposal bags, and transferred through the washroom to the waste storage container. Isolation and critical barriers shall then be removed and bagged as asbestos waste followed by satisfactory visual inspections by the project supervisor and the APM for cleanliness.

3.11 GLOVEBAG REMOVAL

- A. Glovebag removals may only be used as specifically permitted by Code Rule 56 or a Site Specific Variance issued by the NYS Department of Labor. Glovebags may only be used on pipe or duct insulation.
- B. In addition to conformance with applicable regulations and variances, glovebag removals are only permitted to be conducted within tent enclosures complying with these specifications.

CONTRACT No 22-523
DIVISION 2 - EXISTING CONDITIONS

- C. The Contractor shall restrict access to the immediate area where tent/glovebag removal procedures are taking place using barrier tape and/or construction barriers. Caution signs shall be posted.
- D. Remote personnel decontamination enclosures shall be constructed. Configuration shall be as required by Project size and a washroom with attached airlock shall be constructed contiguous to the tent enclosure.
- E. Glovebag removals shall utilize commercially available glovebags of at least six mil thickness. Use shall be in accordance with the manufacturer's instructions and the following minimum requirements:
 - 1. The sides of the glovebag shall be cut to fit the size pipe being removed. Tools shall be inserted into the attached tool pocket.
 - 2. The glovebag shall be placed around the pipe and the open edges shall be folded and sealed with staples and duct tape. The glovebag shall also be sealed at the pipe to form a tight seal.
 - 3. Openings shall be made in the glovebag for the wetting tube and HEPA vacuum hose. The opening shall be sealed to form a tight seal.
 - 4. All glovebags shall be smoke tested by the Asbestos Project Monitor under negative pressure using the HEPA vacuum before removal operations commence. Glovebags that do not pass the smoke test shall be resealed and then retested.
 - 5. After first wetting the materials to be removed, removal may commence. ACM shall be continuously wetted. After removal of the ACM, the piping shall be scrubbed or brushed so that no visible ACM remains. Open ends of pipe insulation shall be encapsulated.
 - 6. After the piping is cleaned, the inside of the glovebag shall be washed down and the wetting tube removed. Using the HEPA vacuum, the glovebag shall be collapsed and then twisted and sealed with tape with the ACM at the bottom of the bag.
 - 7. A disposal bag shall be placed around the glovebag that is then detached from the pipe. The disposal bag is then sealed and transferred through the washroom to the waste storage container.
- F. After glovebag removals are complete, tent decontamination procedures shall be followed.

3.12 REMOVALS OF EXTERIOR NON-FRIABLE ACM

- A. Except as modified by this section, removal of exterior non-friable ACM (i.e. roof flashings, built-up roofing, siding, caulking, glazing compound, transite, tars, sealers, coatings, and other NOB ACM) shall conform to all provisions of this specification.
- B. Unless Site Specific Variances have been otherwise obtained, removals shall be conducted in accordance with the provisions of Code Rule 56.
- C. The Work Area shall be the area from which ACM materials are being removed and shall extend 25 feet from the perimeter of the removal area.
- D. Non-certified Workers are not allowed in the Work Area until the Work Area is cleared by the Asbestos Project Monitor (APM).

CONTRACT No 22-523
DIVISION 2 - EXISTING CONDITIONS

- E. Remote personnel decontamination enclosures shall be constructed at a location in accordance with the approved Work Plan. Unless located outside the Work Area, decontamination enclosures are not permitted to be constructed on the roof. Decontamination enclosures shall be constructed as close to the regulated abatement work area as physically possible, but no greater than 50 feet from the building. It shall be cordoned off at a distance of 25 feet to separate it from public areas.
- F. All openings (including but not limited to operable windows, doors, hatches, vents, ducts, and grilles) one story above, one story below, and within 25 feet of the work area shall be sealed with two layers of six mil polyethylene. Alternately, a polyethylene drape may be used instead of sealing windows individually where permitted by Code Rule 56.
- G. The removal of the ACM may require the use of scrapers, solvents, mastic removal chemicals, or other methods/procedures to ensure complete removal.
- H. The Contractor is required to provide temporary protection of the building (i.e. roof, window openings, construction joints, etc.) at the end of each Work shift so as to maintain the building in a watertight condition.
- I. All asbestos waste generated shall be containerized in the work area, prior to transfer to waste storage trailer/dumpster. No waste shall remain in the work area at the end of each work shift. All waste shall be disposed of as RACM asbestos waste including projects where waste transfer procedures are modified by Site Specific Variance.
- J. Dumpsters used for waste storage shall be lined with two layers of six mil polyethylene and shall have a hard top. Where open-top dumpsters are permitted by a Site Specific Variance, the top shall be closed with polyethylene flaps that are sealed at the end of each work shift.
- K. Personal protective equipment, including respirators, shall be utilized and worn during all removal operations until the Work Area is cleared by the APM.
- L. The Owner may, at his discretion, choose to conduct air sampling. If air samples collected during abatement indicate any airborne asbestos fiber concentration(s) at or above 0.01 f/cc, Work shall be stopped immediately and Work methods shall be altered to reduce the airborne asbestos fiber concentration(s).
- M. Following completion of gross abatement and after all accumulations of asbestos waste materials have been containerized, the following decontamination procedures shall be followed:
 - 1. All surfaces in the Work Area shall be HEPA vacuumed and then wet cleaned.
 - 2. The APM shall conduct a visual inspection of the Work Area for cleanliness and completeness of abatement. The APM shall document the results of the visual inspection in the Project Monitor Log and Contractor's Daily Project Log.
 - 3. Upon satisfactory visual inspection results, the isolation and critical barriers shall be removed and bagged as asbestos waste. Following this, the decontamination enclosures shall be removed.

3.13 NON-FRIABLE FLOORING AND/OR MASTIC REMOVALS

- A. The following procedures may only be used for the removal of non-friable flooring and/or mastic materials using manual and chemical methods. These procedures shall not apply to beadblaster use or other abrasive abatement methods.
- B. The Contractor shall restrict access to the immediate area where non-friable ACM removal procedures are taking place using barrier tape and/or construction barriers. Caution signs shall be posted.
- C. Remote personnel decontamination enclosures may be utilized and shall be constructed at a location in accordance with the approved Work Plan. A washroom with attached airlock shall be constructed contiguous to each Work area enclosure.
- D. The Work Area shall be prepared per section 3.05, except that ceilings, walls, and floors need not be plasticized. However, a four-foot high single layer of 6-mil fire retardant plastic sheeting shall be installed as a splashguard at all walls adjoining mastic removal portions of the work area, to prevent damage to the existing walls.
- E. Negative air shall be maintained at six (6) air changes per hour.
- F. OSHA compliance air monitoring is required per section 1.09.
- G. ACM removal shall follow procedures defined in section 3.07.
- H. Waste material shall be placed in properly labeled 6 mil plastic bags or other appropriate containers. The outside of the bags or containers shall be wet wiped and/or HEPA vacuumed in the washroom and double-bagged before being passed into the airlock. The bags or containers shall then be transported to the waste storage container. All transportation of waste bags and containers outside the Work Area shall be in watertight carts.
- I. Following completion of gross abatement and after all accumulations of asbestos waste materials have been containerized, the following decontamination procedures shall be followed.
 - 1. All bagged asbestos waste and unnecessary equipment shall be decontaminated and removed from the Work Area.
 - 2. All plastic sheeting splashguards shall be removed and containerized, followed by all surfaces in the Work Area being wet cleaned. A wet-purpose shop vacuum may be used to pick up excess liquid, and shall be decontaminated prior to removal from the Work Area.
 - 3. The Contractor shall then apply a thin coat of encapsulant to all non-removal surfaces in the Work Area. In no event shall encapsulant be applied to any surface that was the subject of removal prior to obtaining satisfactory air monitoring results. Encapsulants shall be pigmented or tinted to provide an indication for completeness of coverage. The APM shall determine adequacy of coverage.
 - 4. After the waiting/settling/drying time requirements have elapsed, the Asbestos Project Monitor (APM) shall conduct a visual inspection of the Work Area for cleanliness and completion of abatement. The APM shall document the results of the visual inspection in the Project Monitor Log and Contractor's Daily Project Log.

5. After satisfactory APM visual inspection, aggressive final clearance air sampling shall then be conducted by the Environmental Consultant.
6. Upon receipt of satisfactory final clearance air sampling results, the isolation and critical barriers shall be removed and bagged as asbestos waste. Following this this and satisfactory inspections by the project supervisor and the APM for cleanliness, the decontamination enclosures shall be removed.

3.14 RESTORATION OF UTILITIES, FIRESTOPPING, AND FINISHES

- A. After final clearance, remove locks and restore electrical and HVAC systems. All temporary power shall be disconnected, power lockouts removed and power restored. All temporary plumbing shall be removed.
- B. Finishes damaged by asbestos abatement activities including, but not limited to, plaster/paint damage due to duct tape, staples, and spray adhesives, and floor tile lifted due to wet or humid conditions, shall be restored prior to final payment.
 1. Finishes unable to be restored shall be replaced under this Contract at the Contractor's expense.
 2. All foam and expandable foam products and materials used to seal Work Area openings shall be completely removed upon completion of abatement activities.
- C. All penetrations (including, but not limited to, pipes, ducts, etc.) through fire rated construction shall be firestopped using materials and systems tested in accordance with ASTM E814 on Projects where reinsulation is part of the required work.

PART 4 DISPOSAL OF ASBESTOS WASTE

4.1 TRANSPORTATION AND DISPOSAL SITE

- A. The Contractor's Hauler and Disposal Site shall be approved by the Owner. All waste generated during the asbestos project shall be disposed of as RACM asbestos waste.
- B. The Contractor shall give twenty-four (24) hour notification prior to removing any waste from the site. Waste shall be removed from the site only during normal working hours unless otherwise specified. No waste may be taken from the site unless the Contractor and Environmental Consultant are present and the Environmental Consultant authorizes the release of the waste as described herein.
- C. All waste generated as part of the asbestos project shall be removed from the site within ten (10) calendar days after successful completion of all asbestos abatement work.
- D. Upon arrival at the Project Site, the Hauler must possess and present to the Environmental Consultant a valid New York State Department of Environmental Conservation Part 364 Asbestos Hauler's Permit. The Environmental Consultant may verify the authenticity of the hauler's permit with the proper authority and shall verify that the waste is being transported to the disposal site as listed on the DOL/EPA notifications.
- E. The Hauler, with the Contractor and the Environmental Consultant, shall inspect all material in the transport container prior to taking possession and signing the Asbestos Waste Manifests.

4.2 WASTE STORAGE CONTAINERS

- A. All waste containers shall be fully enclosed and lockable (i.e. enclosed dumpster, trailer, etc.). No open containers will be permitted on-site (i.e. open dumpster with canvas cover, etc.) unless specifically permitted by applicable regulation or a Site Specific Variance. When asbestos contaminated waste must be kept on the work site overnight or longer, it shall be double bagged and stored in accordance with Federal, State, and local laws.
- B. The Environmental Consultant shall verify that the waste storage container and/or truck tags (license plates) match that listed on the New York State Department of Environmental Conservation Part 364 permit. Any container not listed on the permit shall be removed from the site immediately.
- C. The container shall be plasticized and sealed with two (2) layers of 6 mil polyethylene. Once on site, it shall be kept locked at all times, except during load out. The waste container shall not be used for storage of equipment or contractor supplies.
- D. While on-site, the container shall be labeled with EPA Danger signage:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD
- E. The New York State Department of Environmental Conservation Asbestos Hauler's Permit number shall be stenciled on both sides and back of the container.
- F. The container is not permitted to be loaded unless it is properly plasticized, has the appropriate danger signage affixed, and has the permit number appropriately stenciled on the container.
- G. Waste generated off-site is not permitted to be brought onto the Project site and loaded into the waste container.
- H. All asbestos waste removed from the project site shall be transported directly to the disposal site without any additional waste being added to the container during transport.

4.3 HAULER'S ASBESTOS WASTE MANIFESTS

- A. The Hauler's Manifest shall be completed by the Contractor and verified by the Environmental Consultant that all the information and amounts are accurate and the proper signatures are in place.
- B. The Manifests shall have the appropriate signatures of the Environmental Consultant, the Contractor, and the Hauler representatives prior to any waste being removed from the site.
- C. Copies of the completed Owner's Manifest and the Hauler's Manifest shall be retained by the Environmental Consultant and the Contractor and shall remain on site for inspection.

CONTRACT No 22-523
DIVISION 2 - EXISTING CONDITIONS

- D. Upon arrival at the Disposal Site, the Owner's Manifest and the Hauler's Manifest shall be signed by the Disposal Facility operator to certify receipt of ACM covered by the manifest.
- E. The Disposal Facility operator shall return the original Owner's Manifest and the Hauler's Manifest to the Contractor.
- F. The Contractor shall forward copies of the Owner's Manifest and the Hauler's Manifest to the Environmental Consultant within 14 days of the waste container being removed from the site. Failure to do so may result in payment being withheld from the Contractor.
- G. The Contractor shall utilize the Waste Disposal Log provided by the Owner (Appendix A.) This log shall be maintained by the Project Supervisor and shall be kept on site at all times.
- H. All waste disposal manifests and disposal logs shall be submitted by the Contractor to the Owner with the final close-out documentation.

APPENDIX A

WASTE MANIFEST LOG

WASTE MANIFEST LOG

Facility: _____ Building: _____
 Project: _____ Project Number: _____
 Asbestos Contractor: _____ Environmental Consultant: _____

Load No.	Hauler	NYSDEC #	License Plate No.	Size of Container	Disposal Facility	DATES (Chain of Events)		
						Dptr from Site	Rec'd at Landfill	Manifest Returned
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____

COMMENTS:

APPENDIX B

CONTRACTOR'S ACKNOWLEDGEMENT STATEMENT

CONTRACTOR'S ACKNOWLEDGEMENT STATEMENT

Re: Abatement of Asbestos Containing Materials

(Project Title)

(Project Location)

(Project Number)

In consideration of the following individuals' employment in connection with the abatement, handling, and disposal of asbestos containing materials at the referenced project, I hereby certify that the employees: a) have received the medical examinations required by OSHA 29 CFR 1926.1101; b) have been fit tested specifically for respirators used on the Project; and c) have received training as required by OSHA 29 CFR 1926.1101 in the proper handling of asbestos containing materials, including the health implications and risks involved, as well as the use and limitations of the respiratory equipment to be used.

Employee Name

Asbestos Certificate Number

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Supervisor Signature

Printed Name

(Notary block here)

Page ____ of ____

Title

SECTION 02 83 33.13 - REMOVAL AND DISPOSAL OF LEAD-CONTAINING PAINT

1.1 GENERAL

A. Description Of Work

1. This specification covers the removal and disposal of lead-based or lead-containing paint in the following coatings at Building Structures - Rye Playland located at 1 Playland Parkway, Rye, NY 10580.

Structure	Color/Sub straight	Description	Approximate Quantity (SF/LF/Unit)	Procedure
CXA Cross Axis Building A (North Games Buildings)	Green / Wood	South Fascia Trim	50 SF	Manual Wet Scrape / Chemical Strip
	Beige / Wood	South Pilaster	36 SF	
	Beige / Wood	South Columns	150 SF	
	Green / Wood	West Fascia Trim	240 SF	
	Beige / Wood	West Pilaster	24 SF	
	Green / Wood	North Upper Fascia Trim	50 SF	
	Beige / Wood	North Pilaster	60 SF	
	Green/ Wood	East Upper Fascia Trim	30 SF	
	Beige / Wood	East Pilaster	24 SF	
	Green / Wood	East Lower Fascia Trim	40 SF	
AR Northeast Arcade	Beige/Green/ Wood	Cornice/Fascia Elements	1200 SF	
	Beige/Green/ Wood	Wall Cladding/Trim Elements	3500 SF	
	Beige/Green/ Wood	Columns	420 SF	
CXD Cross Axis Building D (South Games Buildings)	Beige/Green/ Wood	Exterior Painted Surfaces	800 SF	
CXF Cross Axis Building E (South Games Buildings)	Beige/Green/ Wood	Exterior Painted Surfaces	200 SF	

CONTRACT No 22-523
 DIVISION 2 - EXISTING CONDITIONS

CXE Cross Axis Building E (South Games Buildings)	Beige/Green/ Wood	Exterior Painted Surfaces	600 SF	Manual Wet Scrape / Chemical Strip
Southeast Arcade (Carousel Arcade)	Green/ Wood	Trim	500 SF	
DCV Dragon Coaster Vendors	Beige/Green/ Wood	Exterior Painted Surfaces	1000 SF	

2. All layers of coating shall be considered as LBP and removed down to the substrates. Substrates coated with LBP and targeted for demolition may be removed and disposed of solid structure waste following TCLP testing.
3. Substrates coated with LBP and targeted for refurbish and recoating shall be abated using manual wet scraping or chemical stripping procedures, localized testing of chemical stripping products shall proceed broader use and only after approval by the DPW Environmental Consultant.
4. The abatement contractor shall separate paint chips and contaminated dust/particulate generated by the abatement from other project waste streams including worker personal protective equipment and plastic sheeting. All waste other than lead paint chips and contaminated dust/particulate shall be TCLP tested prior to disposal.
5. Waste generated by the work of this method shall be stored on site in a NYSDEC compliant Hazardous and Waste Storage Area and transported under manifest to the disposal site.
6. The contractor shall prepare a project specific work plan and project specific HASP for the work of this contract.
7. LBP remediation shall be consistent with guidelines from SSPC and work shall comply with the OSHA regulations including using of decontamination units and hand wash stations.
8. The contractor may propose alternate LBP removal procedures however, use of alternate procedures will require approval by DPW Environmental Consultant; the abatement contractor is responsible with maintaining the physical conditions and integrity of the targeted substrates, and the surrounding structures during abatement work.
9. The Contractor shall request and receive in writing prior to preceding with any work info from the owner regarding surfaces/materials that require protection.

B. Definitions

1. Action Level: Employee exposure, without regard to use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air averaged over an 8 hour period in an occupational/industrial environment.
2. Area Sampling: Sampling of lead concentrations within the lead control area and inside the physical boundaries, which is representative of the airborne lead concentrations but is

not collected in the breathing zone of personnel. This sampling will be conducted by Westchester County Department of Public Works and Transportation (DPW) third party consultant, if required.

3. Certified Contractor: Certified under 40 CFR 745.226 to inspect, assess or remove lead-based paint, dust or soil. Certification as required to provide notification to the Environmental Protection Agency prior to the commencement of lead-based paint abatement activities in residential dwellings and child occupied facilities.
4. Contaminated Room: Room for removal of contaminated personal protective equipment (PPE).
5. Decontamination Shower Facility: That facility that encompasses a clean clothing storage room, and a contaminated clothing storage and disposal rooms, with a shower facility in between.
6. Eight-Hour Time Weighted Average (TWA): Airborne concentration of lead to which an employee is exposed, averaged over an 8 hour workday as indicated in 29 CFR 1926.62.
7. EPA Notification: The certified contractor shall notify the Environmental Protection Agency at least 5 business days prior to conducting lead-based paint abatement in residential or child occupied facilities. The notification requirements for updating and canceling projects shall also be completed as required.
8. High Efficiency Particulate Air (HEPA) Filter Equipment: HEPA filtered vacuuming equipment with a UL 586 filter system capable of collecting and retaining lead-contaminated paint dust. A high efficiency particulate filter means 99.97 percent efficient against 0.3 micron or larger size particles.
9. Lead: Metallic lead, inorganic lead compounds, and organic lead soaps.
10. Lead-Based Paint (LBP): Paint or other surface coating that contains lead in excess of 1.0 milligrams per centimeter squared or 0.5 percent by weight.
11. Lead-Based Paint Hazard (LBP Hazard): Any condition that causes exposure to lead from lead-contaminated dust, lead-contaminated soil, and lead-based paint that is deteriorated or present in accessible surfaces, friction surfaces, or impact surfaces that would result in adverse human health effects.
12. Lead-Containing Paint (LCP): Lead-based paint or other similar surface coating containing lead or lead compound in excess of 0.06 percent by weight of the total nonvolatile content of the paint.
13. Lead Control Area: An enclosed area or structure, constructed as a temporary containment equipped with HEPA filtered local exhaust, which prevents the spread of lead dust, paint chips, or debris existing as a condition of lead-based paint removal operations. The lead control area is also isolated by physical boundaries to prevent unauthorized entry of personnel.
14. Lead Permissible Exposure Limit (PEL): Fifty micrograms per cubic meter of air as an 8 hour time weighted average as determined by 29 CFR 1926.62. If an employee is exposed for more than eight hours in a workday, the PEL shall be determined by the following formula: $PEL \text{ (micrograms/cubic meter of air)} = 400/\text{No. Hours worked per day}$.
15. Personal Sampling: Sampling of airborne lead concentrations within the breathing zone of an employee to determine the 8 hour time weighted average concentration in accordance with 29 CFR 1926.62. Samples shall be representative of the employees' work tasks. The sampling, conducted by the Contractor, shall provide information to complete the required exposure assessment to identify the level of exposure a worker would be subject to without respiratory protection. Whenever there has been a change of

CONTRACT No 22-523
DIVISION 2 - EXISTING CONDITIONS

- equipment, process, control, personnel or a new task has been initiated, the Contractor shall conduct additional personal sampling.
16. Physical Boundary: Area physically roped or partitioned off around an enclosed lead control area to limit unauthorized entry of personnel. As used in this section, "inside boundary" shall mean the same as "outside lead control area but inside boundary."
 17. Project Supervisor (PS): As used in this section, refers to a person employed by the Contractor who is trained and certified in the recognition and control of lead hazards in accordance with current federal, State, and local regulations. The PS shall be trained and certified to inspect, assess or remove lead based paint, dust or soil.
 18. Third Party Consultant: DPW will provide a third party consultant to provide pre-work assessments, project monitoring assessments for the work area and surrounding areas and final clearance assessments.
 19. Worker certifications: All workers inspecting, assessing, or removing lead-based paint, dust or soil who are trained and certified to conduct these activities. As per 40 CFR Part 745 and 29 CFR 1926.

C. Submittals: Submit the following:

1. Product Data:
 - a. Vacuum and negative air filters (if units are required)
 - b. Respirators
2. Test Reports
 - a. Compliance Assessment report
3. Certificates
 - a. Certifications of PS
 - b. Testing laboratory qualifications
 - c. Contractor Consultant qualifications, if any required
 - d. Respiratory protection program
 - e. Hazard communication program
 - f. EPA approved hazardous waste treatment or disposal facility for lead disposal
 - g. Hazardous waste management plan
 - h. Vacuum filters
 - i. Employee training certifications
 - j. Certification of medical examinations
4. Manufacturer's Instructions
 - a. Chemicals and equipment
 - b. Materials
 - c. Material safety data sheets for all chemicals
5. Lead-Based Paint/Lead-Containing Paint Removal Plan (LBP/LCPRP) including PS approval (signature, date, and certification number):
 - a. The job specific plan for the work procedures to be utilized,
 - b. The job specific plan for worker protection issues regarding personal protective equipment, the work procedures, and exposure assessment procedures,
 - c. The job specific plan for protecting the work area, ventilation and drainage systems,
 - d. Collected waste water disposal,
 - e. Paint debris disposal (hazardous and non-hazardous waste).
6. Containment Design
 - a. The containment design proposed for use during surface preparation and clean up activities as required to perform the work. The Plan for staging, installing, moving

- and removing the containment. Include all data, calculations and assumptions used for the design of the containment and ventilation system to ensure that airborne lead concentrations of 30 micrograms per cubic meter of air and baseline lead dust/soil concentrations are not reached or exceeded outside of the lead control area.
- b. Methods to be used to verify adequate air flow characteristics and negative pressure within containment.
 - c. The plan for staging and storing any waste material;
 - d. The plan for establishing barriers to control access of personnel within the exposure zones.
7. Compliance Plan
- a. Establish monitoring programs for the monitoring activities that are the responsibility of the Contractor and include provisions for complying with the results of any monitoring and analysis that is conducted by the Contractor and DPW.
 - b. Establish procedures for monitoring of airborne exposures surrounding project activities and the establishment of visible barriers to control the access of personnel within the exposure zones. DPW will provide instrument monitoring of airborne exposure and/or wipe sampling within the work area or the surrounding areas by a third party consultant.
 - c. Provide procedures for the visual assessment of the ground (soil) to determine whether it has been impacted by project activities, if required. Identify the corrective action that will be taken in the event of unacceptable results. In the event visual assessments of the ground show unacceptable results, the Contractor will undertake the necessary clean up of the ground (soil) as appropriate as directed by DPW. Clean up to pre-project levels will be required. The third party consultant will provide final visual, instrument and wipe sampling to clear the work and surrounding areas.
 - d. Final Clearance Evaluation – Provide written procedures identifying the methods that will be used to conduct final project clean up and the final cleanliness inspections and evaluations that will be undertaken in compliance with the project requirements.
8. Closeout Submittals
- a. Completed and signed hazardous waste manifest from treatment or disposal facility
 - b. Certification of medical examinations, if required
- D. Qualifications of Project Supervisor (PS): Submit name, address, telephone number and the EPA certification number of the PS selected to perform responsibilities specified in paragraph entitled "Project Supervisor (PS) Responsibilities." Provide at least two (2) years of previous experience with lead-based paint abatement projects. Submit proper documentation that the PS is trained and certified in accordance with federal, State, and local laws.
- E. Contractor Consultant Qualifications: Submit the name, address, telephone number and the EPA certification number of the Contractor Consultant (Contractor) if one is selected to perform the worker protection sampling and any additional sampling the Contractor may decide to take. Submit proper documentation that the Contractor consultant is trained and certified as an inspector technician or inspector/risk assessor by the USEPA and authorized State (or local) certification and accreditation program. The Contractor consultant shall have at least two (2) years of previous experience with lead-based paint abatement projects.

- F. Testing Laboratory: Submit the name, address, and telephone number of the testing laboratory selected to perform the air sampling and disposal testing. The air sampling results shall be utilized for reporting of airborne concentrations of lead for Contractor worker protection issues. This sampling will be separate from the third party consultant sampling that will be conducted by DPW. Use a laboratory accredited under the EPA National Lead Laboratory Accreditation Program (NLLAP) by either the American Association for Laboratory Accreditation (A2LA) or the American Industrial Hygiene Association (AIHA) and that is successfully participating in the Environmental Lead Proficiency Analytical Testing (ELPAT) program to perform sample analysis.
- G. Lead-Based Paint/Lead-Containing Paint Removal Plan (LBP/LCPRP): Information to also be included in the LBP/LCPRP not indicated in Section 1.1, C 5 & 6 shall include but not be limited to the following items. The plan shall include a sketch showing the location, size, and details of lead control areas, location and details of the decontamination facilities. Include in the plan, eating, drinking, smoking and sanitary procedures, interface of trades and sequencing of lead related work. Include site preparation and cleanup procedures. Include occupational and environmental sampling (if any by the Contractor), frequency and duration of sampling.
- H. Occupational And Environmental Sampling Results: Submit occupational and environmental sampling results to the DPW within three working days of collection, signed by the testing laboratory responsible official, the employee that performed the sampling, and the PS.
 - 1. The sampling results shall represent each job classification, or if working conditions are similar to previous jobs by the same employer, provide previously collected exposure data that can be used to estimate worker exposures in accordance with 29 CFR 1926.62. The data shall represent the worker's regular daily exposure to lead.
 - 2. Submit worker exposure data conducted during the task based trigger operations of 29 CFR 1926.62.
 - 3. The initial monitoring shall determine the requirements for further monitoring and the need to fully implement the control and protective requirements including the compliance program (LBP/LCP) in accordance with 29 CFR 1926.62.
- I. Occupational And Environmental Assessment Data Report:
 - 1. Some LBP/LCP removal work may not require full implementation of the requirements of 29 CFR 1926.62. Based on the experience of the Contractor and/or the use of a specific process or method for performing the work, the Contractor may be able to provide historic data (previous 12 months) to demonstrate that airborne exposures are controlled below the action level. Such methods or controls shall be fully presented in the LBP/LCPRP. To reduce the full implementation of 29 CFR 1926.62, the Contractor shall provide documentation in an Assessment Data Report.
 - 2. Submit occupational and environmental assessment report to DPW prior to start of work, signed by the testing laboratory responsible official, and the PS.
 - a. Submit a report that supports the determination regarding the reduction of the need to fully implement the requirements of 29 CFR 1926.62 and supporting the LBP/LCP. The exposure assessment shall represent each job classification, or if working conditions are similar to previous jobs by the same employer, provide previously collected exposure data that can be used to estimate worker exposures in accordance with 29 CFR 1926.62. The data shall represent the worker's regular daily exposure to lead for stated work.

- b. Submit worker exposure data conducted during the task based trigger operations of 29 CFR 1926.62 with a complete process description in supporting a negative assessment.
 - c. The initial assessment shall determine the requirement for further monitoring and the need to fully implement the control and protective requirements including the compliance program (LBP/LCPRP) in accordance with 29 CFR 1926.62.
- J. Quality Assurance
- 1. Medical Examinations: Initial medical surveillance as required by 29 CFR 1926.62 shall be made available to all employees exposed to lead at any time (1 day) above the action level. Full medical surveillance shall be made available to all employees on an annual basis who are or may be exposed to lead in excess of the action level for more than 30 days a year or as required by 29 CFR 1926.62. Adequate records shall show that employees meet the medical surveillance requirements of 29 CFR 1926.33, 29 CFR 1926.62, and 29 CFR 1926.103.
 - a. Medical Records: Maintain complete and accurate medical records of employees for a period of at least 30 years or for the duration of employment plus 30 years, whichever is longer.
 - b. Medical Surveillance: Provide medical surveillance to all personnel exposed to lead as indicated in 29 CFR 1926.62.
 - 2. Project Supervisor (PS) Responsibilities
 - a. Certify training as meeting all federal, State, and local requirements.
 - b. Review and approve lead-based paint/lead-containing paint removal plan for conformance to the applicable referenced standards.
 - c. Continuously inspect lead-based paint removal work for conformance with the approved plan.
 - d. Perform air sampling, if required by Contractor.
 - e. Ensure work is performed in strict accordance with specifications at all times.
 - f. Control work to prevent hazardous exposure to human beings and to the environment at all times.
 - g. Certify the conditions of the work as called for elsewhere in this specification.
 - 3. Training: Train each employee performing inspection, assessing, paint removal, disposal, and air sampling operations prior to the time of initial job assignment and annually thereafter, in accordance with 40 CFR 745.225, 29 CFR 1926.21, 29 CFR 1926.62, and State and local regulations.
 - a. Training Certification: Submit a certificate for each employee, signed and dated by the approved training source, stating that the employee has received the required lead training.
 - 4. Respiratory Protection Program
 - a. Furnish each employee required to wear a negative pressure respirator or other appropriate type with a respirator fit test at the time of initial fitting and at least annually thereafter as required by 29 CFR 1926.62.
 - b. Establish and implement a respiratory protection program as required by ANSI Z88.2, 29 CFR 1926.103, 29 CFR 1926.62, and 29 CFR 1926.55.
 - 5. Hazard Communication Program: Establish and implement a Hazard Communication Program as required by 29 CFR 1926.59.
 - 6. Hazardous Waste Management: The Hazardous Waste Management Plan shall comply with applicable requirements of federal, State, and local hazardous waste regulations and address:

- a. Identification and classification of hazardous wastes associated with the work.
 - b. Estimated quantities of wastes to be generated and disposed of.
 - c. Names and qualifications of each Contractor that will be transporting, storing, treating and/or disposing of the wastes. Include the facility location and operator and a 24-hour point of contact. Furnish two copies of EPA, or State and local hazardous waste permit applications or permits or manifests, as required, and coordinate with DPW regarding the use of an existing EPA Identification number or developing separate EPA Identification numbers.
 - d. Names, qualifications and training (experience and training) of personnel who will be working on-site with hazardous wastes.
 - e. List of waste handling equipment to be used in performing the work, to include cleaning, volume reduction, and transport equipment.
 - f. Spill prevention, containment, and cleanup contingency measures including a health and safety plan to be implemented in accordance with 29 CFR 1926.65.
 - g. Work plan and schedule for waste containment, removal and disposal. Wastes shall be cleaned up and containerized daily.
 - h. Unit cost for hazardous waste disposal according to this plan.
7. Environmental, Safety and Health Compliance: In addition to the detailed requirements of this specification, comply with laws, ordinances, rules, and regulations of Federal, State, and local authorities regarding removing, handling, storing, transporting, and disposing of lead waste materials. Comply with the applicable requirements of the current issue of 40 CFR Part 745 and 29 CFR 1926.62. Submit matters regarding interpretation of standards to DPW for resolution before starting work. Where specification requirements and the referenced documents vary, the most stringent requirement shall apply.
8. Pre-Construction Conference: Along with the PS, meet with DPW and any facility or consultant representatives to discuss in detail the hazardous waste management plan and the lead-based paint/lead-containing paint removal plan, including work procedures and precautions for the removal plan.

K. Equipment

1. Respirators: Furnish appropriate respirators approved by the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services, for use in atmospheres containing lead dust. Respirators shall comply with the requirements of 29 CFR 1926.62.
2. Special Protective Clothing: Furnish personnel who will be exposed to lead-contaminated dust with proper disposable uncontaminated, reusable protective whole body clothing, head covering, gloves, and foot coverings as required by 29 CFR 1926.62. Furnish proper disposable plastic or rubber gloves to protect hands. Reduce the level of protection only after obtaining approval from the PS.
3. Vacuum Filters: UL 586 labeled HEPA filters.
4. Equipment for Owner's Personnel: Furnish DPW with two complete sets of personal protective equipment (PPE) daily, as required herein, for entry into and inspection of the paint removal work within the lead controlled area. Personal protective equipment shall include disposable whole body covering, including appropriate foot, head, and hand protection. PPE shall remain the property of the Contractor. The Owner will provide respiratory protection for DPW and their representatives.

L. Removal

CONTRACT No 22-523
DIVISION 2 - EXISTING CONDITIONS

1. Title to Materials: Materials resulting from demolition work, except as specified otherwise, shall become the property of the Contractor and shall be disposed of in accordance with all federal, State and local regulations.

1.2 PRODUCT

- A. Chemicals: Submit applicable Safety Data Sheets for all chemicals used in paint removal work. Use the least toxic product approved by DPW.

1.3 EXECUTION

A. Protection

1. Notification: Notify DPW 20 days prior to the start of any lead based paint removal work.
2. Notification: Notify the Environmental Protection Agency at least 5 days prior to conducting lead-based paint abatement activities in a residential dwelling or child occupied facility.
3. Lead Control Area Requirements
 - a. If LBP will be removed by means which will not likely create airborne, lead-containing dust (such as careful wet scraping or chemical stripping), establish a lead control area by situating critical barriers and physical boundaries around the area or structure where LBP/LCP removal operations will be performed.
 - b. If removal practice will create airborne, lead-containing dust (such as sanding, abrasive blasting, thermal cutting, demolition, or needle gun use), utilize full containment procedures - Contain removal operations by the use of critical barriers and HEPA filtered exhaust or a negative pressure enclosure system with decontamination facilities and with HEPA filtered exhaust if required by the PS, as directed.
4. Protection of Existing Work to Remain: Perform paint removal work without damage or contamination of adjacent areas. Where existing work is damaged or contaminated, restore work to its original condition or better.
5. Boundary Requirements: Provide physical boundaries around the lead control area by roping off the area designated in the work plan or providing curtains, portable partitions or other enclosures to ensure that airborne concentrations of lead will not reach 30 micrograms per cubic meter of air outside of the lead control area.
 - a. Physical Boundary: Provide physical boundaries around the lead control area by roping off the area designated in the work plan or providing curtains, portable partitions or other enclosures to ensure that airborne concentrations of lead will not reach 30 micrograms per cubic meter of air outside of the lead control area.
 - b. Warning Signs: Provide warning signs at approaches to lead control areas. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the area. Signs shall comply with the requirements of 29 CFR 1926.62.
6. Furnishings:
 - a. The Owner will remove furniture and equipment from the building before lead-based paint removal work begins.
or

Furniture and equipment will remain in the building. Protect and cover furnishings or remove furnishings from the work area and store in a location approved by DPW.

or

Existing furniture and equipment is lead contaminated, decontaminate, dispose of as lead contaminated waste.

7. Heating, Ventilating and Air Conditioning (HVAC) Systems: Shut down, lock out, and isolate HVAC systems that supply, exhaust, or pass through the lead control areas. Seal intake and exhaust vents in the lead control area with 6 mil plastic sheet and tape. Seal seams in HVAC components that pass through the lead control area. Provide temporary HVAC system for areas in which HVAC has been shut down outside the lead control area.
 8. Decontamination Shower Facility: Provide clean and contaminated change rooms and shower facilities in accordance with this specification and 29 CFR 1926.62.
 9. Eye Wash Station: Where eyes may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes shall be provided within the work area.
 10. Mechanical Ventilation System
 - a. Use adequate ventilation to control personnel exposure to lead in accordance with 29 CFR 1926.62.
 - b. To the extent feasible, use fixed local exhaust ventilation connected to HEPA filters or other collection systems, approved by the PS. Local exhaust ventilation systems shall be designed, constructed, installed, and maintained in accordance with ANSI Z9.2.
 - c. Vent local exhaust outside the building only and away from building ventilation intakes.
 - d. Use locally exhausted, power actuated, paint removal tools.
 11. Personnel Protection: Personnel shall wear and use protective clothing and equipment as specified herein. Eating, smoking, or drinking or application of cosmetics is not permitted in the lead control area. No one will be permitted in the lead control area unless they have been appropriately trained and provided with protective equipment.
- B. Work Procedures: Perform removal and disposal of lead-based paint in accordance with approved lead-based paint/lead-containing paint removal plan. Use procedures and equipment required to limit occupational and environmental exposure to lead when lead-based paint is removed in accordance with 29 CFR 1926.62, except as specified herein.
1. Personnel Exiting Procedures: Whenever personnel exit the lead-controlled area, they shall perform the following procedures and shall not leave the work place wearing any clothing or equipment worn during the work day:
 - a. Vacuum themselves off.
 - b. Remove protective clothing in the contaminated change room, and place them in an approved impermeable disposal bag.
 - c. Shower or Wash hands and face at the site, as directed, don appropriate disposable or uncontaminated reusable clothing; move to an appropriate facility; shower.
 - d. Change to clean clothes prior to leaving the physical boundary designated around the lead control area.
 2. Sampling

CONTRACT No 22-523
DIVISION 2 - EXISTING CONDITIONS

- a. Air sample for lead in accordance with 29 CFR 1926.62 and as specified herein. Air sampling shall be directed or performed by the PS.
 - 1) The PS shall be on the job site directing the air sampling and inspecting the lead-based paint removal work to ensure that the requirements of the contract have been satisfied during the entire lead-based paint removal operation.
 - 2) Collect personal air samples on employees who are anticipated to have the greatest risk of exposure as determined by the PS. In addition, collect air samples on at least 25 percent of the work crew or a minimum of two employees; whichever is greater, during each work shift.
 - 3) Submit results of air samples, signed by the PS, within 24 hours after the air samples are taken. Notify DPW immediately of exposure to lead at or in excess of the action level of 30 micrograms per cubic meter of air outside of the lead control area.
 - b. Surface and/or soil sampling shall be conducted as required for residential dwellings and child occupied facilities or as may be required for high profile, sensitive work areas, such as administrative buildings, kitchens, barracks, etc., to determine clearance (i.e., that the work has not contaminated surfaces within and adjacent to the control area) will be performed by a third party consultant provided by DASNY. Notification to DPW will also outline any sampling requirements to be provided for the work.
 - 1) Before any work begins, DPW's third party consultant will collect and analyze baseline soil or wipe samples in accordance with methods defined in federal, State, and local standards inside and outside of the physical boundary to assess the degree of soil and/or dust contamination prior to lead-based paint removal activities are initiated.
 - 2) After all work is completed, DPW's third party consultant will collect and analyze soil or wipe samples in accordance with methods defined in federal, State, and local standards inside and outside of the physical boundary to assess the degree of soil and/or dust contamination after the lead-based paint removal activities are completed.
 - c. Area Air Sampling During Paint Removal Work: DPW will conduct area air sampling while lead-based paint removal operations are performed, in areas immediately adjacent to the lead control area. Area monitoring shall be conducted to ensure unprotected personnel adjacent to the lead control area are not exposed at or above 30 micrograms per cubic meter of air. If 30 micrograms per cubic meter of air is reached or exceeded, the Contractor will be advised to stop work, and correct the condition(s) causing the increased levels. DPW will determine if condition(s) require any further change in work methods. Removal work shall resume only after approval is given by DPW. For outdoor operations, at least one sample on each shift shall be taken on the downwind side of the lead control area.
3. Lead-Based Paint Removal
 - a. Provide methodology for removing LBP/LCP in the work plan. Remove paint within the areas designated on the drawings in order to completely expose the substrate. Take whatever precautions necessary to minimize damage to the underlying substrate.
 - b. Avoid flash rusting or deterioration of the substrate. Co-ordinate surface preparations as required by DPW.

- c. Provide methodology for LBP/LCP removal processes to minimize contamination of work areas outside the control area with lead-contaminated dust or other lead-contaminated debris/waste and to ensure that unprotected personnel are not exposed to hazardous concentrations of lead. Describe this LBP/LCP removal process in the LBP/LCPRP.
 - d. Indoor Lead Paint Removal: Perform manual or mechanical or thermal or chemical, as directed, paint removal in lead control areas using enclosures, barriers, or containments and powered locally exhausted paint removal tools. Collect residue and/or debris for disposal in accordance with federal, State, and local requirements.
 - e. Outdoor Lead Paint Removal: Perform outdoor removal as indicated in federal, State, and local regulations and in the LBP/CPRP. The worksite preparation (barriers or containments) shall be job dependent and presented in the LBP/LCPRP.
 - f. Sampling After Paint Removal: After the visual inspection, DPW will conduct soil sampling if bare soil is present during external removal operations and collect area air samples inside and outside the lead control area to determine the airborne levels of lead inside and outside the work area. DPW will collect wipe samples according to the HUD protocol contained in HUD Guidelines to determine the lead content of settled dust and dirt in micrograms per square foot of surface area and parts per million (ppm) or micrograms per gram ($\mu\text{g/g}$) for soil.
4. Cleanup and Disposal
- a. Cleanup: Maintain surfaces of the lead control area free of accumulations of paint chips and dust. Restrict the spread of dust and debris; keep waste from being distributed over the work area. Do not dry sweep or use compressed air to clean up the area. At the end of each shift and when the paint removal operation has been completed, clean the area of visible lead paint contamination by vacuuming with a HEPA filtered vacuum cleaner, wet mopping the area and wet wiping the area as indicated by the PS. Re-clean areas showing dust or residual paint chips or debris. After visible dust, chips and debris is removed, wet wipe and HEPA vacuum all surfaces in the work area. If adjacent areas become contaminated at any time during the work, clean, visually inspect, and then wipe sample all contaminated areas. The PS shall then certify in writing that the area has been cleaned of lead contamination before restarting work.
 - b. Clearance Certification
 - 1) The Contractor shall document in writing and provide analytical documentation to certify that the employee exposure to an airborne concentration of lead were below the required action level, respiratory protection used for the employees was adequate; the work procedures were performed in accordance with 29 CFR 1926.62 and 40 CFR 745; and that there were no visible accumulations of material and dust containing lead left in the work site. Do not remove the lead control area or roped off boundary and warning signs prior to DPW's acknowledgement of the third party sampling results, if required, and upon receipt of the Contractor certification.
 - 2) The DPW third party consultant shall certify surface wipe sample results collected inside and outside the work area are less than 100 micrograms per square foot on uncarpeted floors, less than 500 micrograms per square foot on interior window sills and less than 800 micrograms per square foot on

- window troughs or not significantly greater than the initial surface loading determined prior to work, as directed.
- 3) For exterior paint removal work, the DPW third party consultant will provide soil samples taken at the exterior of the work site to be used to determine if soil lead levels had increased at a statistically significant level (significant at the 95 percent confidence limit) from the soil lead levels prior to the work. If soil lead levels do show a statistically significant increase above any applicable Federal or State standard for lead in soil, the soil shall be remediated back to the pre-work level.
- c. Testing of Lead-Based Paint Residue and Used Abrasive: The Contractor shall test paint residue and used abrasive in accordance with 40 CFR 261 for hazardous waste.
 - d. Disposal
 - 1) Collect lead-contaminated waste, scrap, debris, bags, containers, equipment, and lead-contaminated clothing, which may produce airborne concentrations of lead particles. Label the containers in accordance with 29 CFR 1926.62 and 40 CFR 261. Dispose of lead-contaminated waste material at an EPA or State approved hazardous waste treatment, storage, or disposal facility off Owner's property.
 - 2) Store waste materials in U.S. Department of Transportation (49 CFR 178) approved 55-gallon drums. Properly label each drum to identify the type of waste (49 CFR 172) and the date the drum was filled. DPW or an authorized representative will assign an area for interim storage of waste-containing drums. Do not store hazardous waste drums in interim storage longer than 90 calendar days from the date affixed to each drum.
 - 3) Handle, store, transport, and dispose lead or lead-contaminated waste in accordance with 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, and 40 CFR 265. The Contractor shall provide documentation the transporter is authorized to transport the waste, authorized to deliver the waste to the treatment, storage, or disposal facility and the treatment, storage, or disposal facility is authorized to accept the waste. Comply with land disposal restriction notification requirements as required by 40 CFR 268.
 - 4) All material, whether hazardous or non-hazardous shall be disposed in accordance with laws and provisions and federal, State, or local regulations. Ensure waste is properly characterized. The result of each waste characterization (TCLP for RCRA materials) will dictate disposal requirements.
 5. Disposal Documentation: Submit written evidence the hazardous waste treatment, storage, or disposal facility (TSD) is approved for lead disposal by the EPA and State or local regulatory agencies. Submit one copy of the completed manifest, signed and dated by the initial transporter in accordance with 40 CFR 262.
 6. Payment for Hazardous Waste: Payment for disposal of hazardous waste will not be made until a signed copy of the manifest from the treatment or disposal facility certifying the amount of lead-containing materials delivered is returned and a copy is furnished to the Owner.

END OF SECTION 13283

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SECTION 03 05 51 - CONCRETE BONDING AGENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Epoxy Bonding Agents (Adhesive) for cast-in-place concrete.

1.2 REFERENCES

A. General Requirements:

1. Except as modified by governing codes and by this Specification, comply with the applicable provisions and recommendations of latest editions of the following.
2. Where the language in any of the documents referred to herein is in the form of a recommendation or suggestion, such recommendations or suggestions shall be deemed to be mandatory under this Contract unless otherwise directed by the Engineer.
3. Conflicts: Conform to requirements of cited standard unless specified otherwise. In case of apparent conflict between standards, or between standards and the specifications herein, the more stringent shall apply unless otherwise directed by the Engineer.

B. American Concrete Institute:

1. ACI 503.1 – Bonding Hardened Concrete, Steel, Wood, Brick, and Other Materials to Hardened Concrete with a Multi-Component Epoxy Adhesive
2. ACI 503.2 – Bonding Plastic Concrete to Hardened Concrete with a Multi-Component Epoxy Adhesive
3. ACI 318 – Building Code Requirements for Structural Concrete

C. ASTM International:

1. ASTM C881 – Epoxy-Resin-Base Bonding Systems for Concrete.
2. ASTM C882 – Bond Strength of Epoxy Resin Systems Used with concrete by Slant Shear
3. ASTM D570 – Standard Test Method for Water Absorption of Plastics
4. ASTM D638 – Standard Test Method for Tensile Properties of Plastics
5. ASTM D648 – Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position
6. ASTM D695 – Standard Test Method for Compressive Properties of Rigid Plastics

D. American Association of State Highway and Transportation Officials (AASHTO)

1. AASHTO 235 – Standard Specification for Epoxy Resin Adhesives

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, properties, including surface preparation and placement instructions.
- B. Safety Data Sheets.

1.4 QUALITY ASSURANCE

- A. Products used in the work of this section shall be produced by manufacturer's who are regularly engaged in the manufacturer and/or supply of similar items for at least five (5) years and which have a history of successful production, acceptable to the Engineer.
- B. The Contractor shall provide an adequate number of trained workmen experienced in the work of this Section.
- C. Workmen shall have received training of the use of the products of this Section by a manufacturer's representative.
- D. The Contractor shall provide the services of a qualified manufacturer's technical representative who shall instruct the Contractor's personnel in the mixing, proper use and application of the bonding agents.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver in manufacturer's original, unopened containers with proper labels intact. Damaged containers shall be removed from the project site.
- B. Store in a dry shelter in accordance with manufacturer's instructions. Maintain storage area temperature within limits set by the manufacturer.
- C. Keep containers sealed until ready for use.
- D. Protect materials during handling, mixing and application to prevent damage or contamination.
- E. Condition the materials in accordance with manufacturer's instructions prior to use.
- F. Mix, apply and clean-up materials in accordance with all safety and weather conditions required by the manufacturer, or as modified by applicable rules and regulations of local, state and federal authorities.
- G. Consult Material Safety Data Sheets (MSDS) for complete handling recommendations.

PART 2 PRODUCTS

2.1 BONDING AGENTS

- A. Bonding agents shall be a two (2) component, 100% solids, 100% reactive compound epoxy adhesive suitable for use on dry or damp surfaces.
- B. Bonding Agents shall be ASTM C881 and AASHTO 235 compliant and suitable for use under ACI 503.1, ACI 503.2, ACI 503.3 and ACI 503.4.
- C. Bonding compounds shall conform to the following properties:

Property	Test	Time	Result
Bond Strength - Plastic Concrete to Hardened Concrete, Moist Cure	ASTM C882	2 days	1,700 psi (min.)
		14 days	2,200 psi (min.)
Compressive Strength	ASTM D695	28 days	11,000 psi (min.)
Tensile Strength	ASTM D638	7 day	6,900 psi (min.)
Water Absorption	ASTM D570	7 Day	0.35% (max.)

- D. Acceptable Products and Manufacturers:
 - 1. Sikadur 32, Hi-Mod – Sika Chemical Co.
 - 2. Euco #452 Epoxy system – Euclid Chemical Co.
 - 3. Or Approved Equal

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive bonding agents. Do not begin surface preparation unacceptable conditions are corrected.

3.2 SURFACE PREPARATION

- A. Prepare all contact surfaces in accordance with manufacturer’s recommendations.
- B. Remove defective concrete, laitance, dirt, oil, grease and other foreign material from concrete surfaces by brushing, hammering, chipping or other similar means until sound, clean concrete surface is achieved.
- C. Prepare surfaces mechanically to provide a surface profile in accordance with manufacturer’s instructions.

3.3 MIXING

- A. Ensure components are at proper temperature prior to mixing.

CONTRACT No. 22-523
DIVISION 3 – CONCRETE

B. Mix components in accordance with manufacturer's instructions.

C. Mix only quantity that can be applied within its pot life.

3.4 APPLICATION

A. All work shall be done in strict accordance with manufacturer's recommendations, including special precautions, procedures and limitations.

B. Apply bonding agents in accordance with manufacturer's instructions. Ensure bonding agent, substrate and air temperatures are within the manufacturer's specified limits.

3.5 CLEAN-UP

A. Clean-up in accordance with manufacturer's instructions.

– END OF SECTION –

SECTION 03 05 55 - CONCRETE ADMIXTURES AND ADDITIVES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Admixtures and additives for cast-in-place concrete.
- B. Related Sections:
 - 1. Section 03 05 51 – Concrete Bonding Agents
 - 2. Section 03 11 13 – Structural Cast-in-Place Concrete Forming
 - 3. Section 03 15 00 – Concrete Accessories
 - 4. Section 03 21 00 – Reinforcing Steel
 - 5. Section 03 22 00 – Welded Wire Fabric Reinforcing
 - 6. Section 03 30 00 – Concrete and Reinforcing Steel
 - 7. Section 03 39 00 – Concrete Curing
 - 8. Section 03 60 00 – Grout

1.2 REFERENCES

- A. General Requirements:
 - 1. Except as modified by governing codes and by this Specification, comply with the applicable provisions and recommendations of latest editions of the following.
 - 2. Where the language in any of the documents referred to herein is in the form of a recommendation or suggestion, such recommendations or suggestions shall be deemed to be mandatory under this Contract unless otherwise directed by the Engineer.
 - 3. Conflicts: Conform to requirements of cited standard unless specified otherwise. In case of apparent conflict between standards, or between standards and the specifications herein, the more stringent shall apply unless otherwise directed by the Engineer.
- B. American Concrete Institute:
 - 1. ACI 211.1 – Standards Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete
 - 2. ACI 211.2 – Standard Practice for Selecting Proportions for Structural Lightweight Concrete
 - 3. ACI 212.3R – Chemical Admixtures for Concrete
 - 4. ACI 212.4R – Guide for Use of High-Range Water-Reducing Admixtures (Superplasticizers) in Concrete
 - 5. ACI 301 – Specifications for Structural Concrete.
 - 6. ACI 302.1R – Guide for Concrete Floor and Slab Construction
 - 7. ACI 304R – Guide for Measuring, Mixing, Transporting, and Placing Concrete
 - 8. ACI 304.2R – Placing Concrete by Pumping Methods
 - 9. ACI 304.4R – Placing Concrete with Belt Conveyors
 - 10. ACI 305.1 – Standard Specifications for Hot Weather Concreting

CONTRACT NO. 22-523
DIVISION 3 - CONCRETE

11. ACI 305 – Hot Weather Concreting.
 12. ACI 306.1 – Standard Specification for Cold Weather Concreting
 13. ACI 306R – Cold Weather Concreting
 14. ACI 318 – Building Code Requirements for Structural Concrete
- C. ASTM International:
1. ASTM C94/C94M – Standard Specification for Ready-Mixed Concrete.
 2. ASTM C143/C143M – Standard Test Method for Slump of Hydraulic Cement Concrete.
 3. ASTM C150 – Standard Specification for Portland Cement.
 4. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.
 5. ASTM C494/C494M – Standard Specification for Chemical Admixtures for Concrete.
 6. ASTM C595 – Standard Specification for Blended Hydraulic Cements.
 7. ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
 8. ASTM C989 – Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
 9. ASTM C1017/C1017M – Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
 10. ASTM C1240 – Standard Specification for Silica Fume Used in Cementitious Mixtures.
- D. New York State Department of Transportation Standard Specifications (NYSDOT-SS):
1. Section 501-2.03 – Concrete Batching Facility Requirements
 2. Section 501-3.03 – Concrete Mixing, Transporting and Discharging

1.3 SUBMITTALS

- A. Product Data: Submit data for all additives and admixtures.
- B. Concrete Mix Designs for all mixes with proposed admixtures to be included.
- C. Identify chloride content of admixtures and whether or not chloride was added during manufacturing.
- D. Certification of Compatibility
 1. Contractor shall provide certification that all materials and admixtures are compatible with each other.
- E. Laboratory Test Data:
 1. Laboratory test reports by the supplier of chemical admixtures containing information on the chloride ion content and alkali content expressed as Na₂O equivalent. Test reports are not required for air entraining admixtures used at dosages less than 130 ml per 100 kg (2 fl oz per 100 lb) or cement of nonchloride chemical admixtures used at maximum dosages less than 325 ml per 100 kg (5 fl oz per 100 lb). Both the chloride ion and total alkali content of the admixtures are

to be expressed in percent by mass of cement for a stated or typical dosage of the admixture.

2. Laboratories supplying test reports or data shall provide evidence that the laboratory is properly equipped and qualified to perform the tests method(s) in conformance with ASTM C1077 and C1222.

1.4 QUALITY ASSURANCE

- A. Products used in the work of this section shall be produced by manufacturer's who are regularly engaged in the manufacturer and/or supply of similar items for at least five (5) years and which have a history of successful production, acceptable to the Engineer

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Provide admixtures produced by established reputable manufacturers, and use in compliance with the manufacturer's printed instructions.
- B. All admixtures shall be provided by manufacturers capable of providing qualified field service representation.
- C. All admixtures shall be compatible with other admixtures and cementitious materials.
- D. Admixtures shall not contain more chloride ions than present in municipal drinking water.
- E. Do not use admixtures containing calcium chloride.
- F. Mix Designs not containing fly ash shall include air entraining and water-reducing admixtures as required. High-range water reducing admixtures may be added to improve workability. High-range water reducing admixtures shall be used to facilitate pumping.
- G. Mix Designs containing fly ash shall include air entraining and high-range water-reducing admixtures as required.
- H. Do not air entrain interior concrete floors and suspended slabs in buildings that will receive a trowel finish. Do not allow entrapped air content to exceed 3 percent.
- I. Do not use admixtures which have not been incorporated and tested in the accepted design mixes, unless otherwise authorized by the Engineer.

2.2 WATER REDUCING ADMIXTURE

- A. The admixture shall conform to ASTM C494, Type A and not contain more chloride ions than are present in municipal drinking water.

CONTRACT NO. 22-523
DIVISION 3 - CONCRETE

- B. Acceptable Products and Manufacturers:
 - 1. WRDA with Hycol – W.R. Grace & Co.
 - 2. Eucon WR-75 – Euclid Chemical Co.
 - 3. MasterPozzoloth 200 – Master Builders
 - 4. Or Approved Equal

2.3 WATER REDUCING RETARDING ADMIXTURE

- A. The admixture shall conform to ASTM C494, Type D and not contain more chloride ions than are present in municipal drinking water.
- B. Acceptable Products and Manufacturers:
 - 1. Eucon WR-75 – Euclid Chemical Co.
 - 2. MasterSet R 100 – Master Builders
 - 3. Plastiment XR – Sika Chemical Corp.
 - 4. Or Approved Equal

2.4 HIGH RANGE WATER REDUCING RETARDING ADMIXTURE (SUPERPLASTICIZER)

- A. The admixture shall conform to ASTM C494, Type F or G, and not contain more chloride ions than are present in municipal drinking water.
- B. Acceptable Products and Manufacturers:
 - 1. Daracem 19 or Daracem 100 – W.R. Grace & Co.
 - 2. Eucon 37 – Euclid Chemical Co.
 - 3. MasterRheobuild 1000 – Master Builders
 - 4. Sikament SPMN – Sika Chemical Co.
 - 5. Or Approved Equal.

2.5 AIR ENTRAINING ADMIXTURES

- A. The admixture shall conform to ASTM C-260 and not contain more chloride ions than present in municipal drinking water.
- B. Acceptable Products and Manufacturers:
 - 1. Darex AEA – W.R. Grace & Co.
 - 2. Eucon Air Mix – Euclid Chemical Co.
 - 3. MasterAir AE 200 – Master Builders
 - 4. Sika-AIR – Sika Chemical Co.
 - 5. Or Approved Equal

2.6 NON-CHLORIDE ACCELERATING ADMIXTURES

- A. The admixture shall conform to ASTM C 494/C 494M requirements for Type C accelerating and not contain more chloride ions than present in municipal drinking water.
- B. Non-chloride accelerating admixtures shall only be used during cold weather concreting.

- C. Acceptable Products and Manufacturers:
 - 1. MasterSet FP 20 – Master Builders
 - 2. SikaSet NC – Sika Chemical Co.
 - 3. Accelguard 80 – Euclid Chemical Co.
 - 4. Or Approved Equal

2.7 PROHIBITED ADMIXTURES

- A. Calcium chloride, thiocyanates or admixtures containing more than 0.05% chloride ions are not permitted. No admixture shall cause an increase in shrinkage when tested in accordance with ASTM C494 and ASTM C157

PART 3 EXECUTION

3.1 GENERAL

- A. Accurately proportion admixtures in accordance with those established in the design mix.
- B. Admixtures shall be added in accordance with manufacturer's printed instructions.

3.2 READY MIX CONCRETE

- A. Ready Mix Concrete Plants shall be provided with Admixture Dispensing Systems equipped with calibrated systems that meet the following:
 - 1. A sufficient number of dispensing systems to supply the concrete mixture specified.
 - 2. The ability to dispense each admixture through its own measuring system
 - 3. Accurate measurement within the tolerance limits specified in Table 501-4, Batching Tolerances.
 - 4. A bypass valve to obtain a calibrated sample of admixture from each measuring device.
 - 5. Uniform distribution of admixture throughout the mix within the specified mixing period.
 - 6. When multiple admixtures are added, no direct contact with each other prior to mixing.
 - 7. An approved automatic admixture dispensing system in plants equipped with automated proportioning systems.
 - 8. Volumetric measuring devices interlocked with the automated proportioning equipment that insures the preset quantity has been actually measured and completely discharged.
 - 9. A readable indication at the operator's normal work station of the actual quantity batched.
 - 10. Interlock the admixture system with the automated proportioning system so that aggregate and/or cement weigh hopper discharge gates cannot be opened until the preset quantity of admixture has been batched or discharged.
 - 11. Recordation of the presence of admixture is dependent on completion of admixture discharge.

CONTRACT NO. 22-523
DIVISION 3 - CONCRETE

3.3 BATCH MIXING AT SITE

- A. Batch mixing of admixtures on-site shall not be permitted without prior approval of the Engineer.

3.4 REDOSAGE

- A. Redosage of admixtures on-site shall not be permitted without prior approval of the Engineer.

– END OF SECTION –

SECTION 03 11 13 - STRUCTURAL CAST-IN-PLACE CONCRETE FORMING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Formwork for cast-in place concrete.
 - 2. Shoring, bracing, and anchorage.
 - 3. Form stripping.
- B. Related Sections:
 - 1. Section 03 15 00 – Concrete Accessories
 - 2. Section 03 30 00 – Concrete and Reinforcing Steel
 - 3. Section 03 39 00 – Concrete Curing
 - 4. Section 03 60 00 – Grout
 - 5. Section 07 92 00 – Joint Sealants

1.2 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 117 – Standard Specifications for Tolerances for Concrete Construction and Materials.
 - 2. ACI 301 – Specifications for Structural Concrete.
 - 3. ACI 302.1 – Recommended Practice for Concrete Floor and Slab Construction
 - 4. ACI 318 – Building Code Requirements for Structural Concrete.
 - 5. ACI 347 – Guide to Formwork for Concrete.
 - 6. ACI 350.4R – Design Considerations for Environmental Engineering Concrete
- B. American Forest and Paper Association:
 - 1. AF&PA – National Design Specifications for Wood Construction.
- C. National Institute of Standards and Technology (NIST):
 - 1. NIST Voluntary Product Standard PS 1 – Structural Plywood.
 - 2. NIST Voluntary Product Standard PS 20 – American Softwood Lumber Standard
- D. APA – The Engineered Wood Association (APA/EWA)
- E. West Coast Lumber Inspection Bureau:
 - 1. WCLIB – Standard 17 Grading Rules for West Coast Lumber.

1.3 DESIGN REQUIREMENTS

- A. Design of all formwork, shoring and bracing shall be prepared by a Professional Engineer licensed in the State of New York.
- B. Design, engineer and construct formwork, shoring and bracing in accordance with ACI 301, 302, 318 and 347; and all applicable Federal, State and Municipal codes and

regulations including revisions to date of contract to achieve concrete shape, line and dimension as indicated on the Contract Drawings.

- C. Design, erect, support and maintain formwork so that it will safely support vertical and lateral loads that might be applied, until such loads can be supported by the concrete structure.
- D. Carry vertical and lateral loads to ground by formwork systems and in-place construction that has attained adequate strength for that purpose.
- E. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation and position.
- F. Design forms and falsework to include assumed values of live load, dead load, weight of moving equipment operated on formwork, concrete mix, height of concrete drop, vibratory frequency, ambient temperature, foundation pressures, stresses, lateral stability and other factors pertinent to the safety of the structure.
- G. Provide shores and struts with positive means of adjustment capable of taking up formwork settlement during concrete placement operations, using wedges or jacks or a combination thereof.
- H. Provide trussed supports when adequate foundations for shores and struts cannot be secured.
- I. Support form facing material by structural members spaced sufficiently close to prevent objectionable deflection.
- J. Fit forms placed in successive units for continuous surfaces to accurate alignment, free from irregularities, and within allowable tolerances.
- K. Provide camber in formwork as required for anticipated deflections due to weight and pressures of fresh concrete and construction loads.
- L. Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement.

1.4 SUBMITTALS

- A. Formwork Shop Drawings: Signed and sealed by a registered New York State licensed professional engineer detailing fabrication, assembly, and support of formwork. Design and engineering of formwork, shoring and bracing are Contractor's responsibility.
- B. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing reshoring. Submit details of form types, method of form construction and erection, design computations and location of form joints, form ties and embedded items. Formwork shop drawings shall include the following as a minimum:

CONTRACT NO. 22-523
DIVISION 3 - CONCRETE

1. Pertinent dimensions, openings, methods of construction, types of connections, materials, joint arrangement and details, ties and shores, location of framing, studding and bracing, and temporary supports.
 2. All joint locations shall be shown and detailed on the drawings.
 3. Means of leakage prevention for concrete exposed to view in finished construction.
 4. Sequence and timing of erection and stripping of formwork.
 5. Required compressive strength of concrete at time of formwork stripping
 6. Height of concrete lift and height of concrete drop during concrete placement.
 7. Vertical, horizontal and special loads in accordance with ACI 347, Section 2.2 and camber diagrams, when applicable.
 8. Notes to formwork erector showing size and location of conduits and piping embedded in concrete in accordance with ACI 318, Section 6.3.
 9. Procedure and schedule for removal of shores.
- C. Product Data: Submit data with descriptions and installation instructions for:
1. Form Materials
 2. Form Systems
 3. Form Ties
 4. Form Spreaders
 5. Corner Formers
 6. Form Coatings
 7. Form Release Agents
- D. Design Data: Signed and sealed by Professional Engineer registered in the State of New York
1. Indicate design data for formwork and shoring.
 2. Indicate loads transferred to structure during process of concreting and shoring.
 3. Structural calculations to support design of formwork and shoring.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301, ACI 302, ACI 318 and ACI 347.
- B. For wood products furnished for work of this Section, comply with AF&PA.
- C. Perform Work in accordance with all applicable Federal, State and Municipal codes and regulations including revisions to date of contract.

1.6 QUALIFICATIONS

- A. Design formwork under direct supervision of Professional Engineer experienced in design of this Work and registered in the State of New York.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver void forms and installation instructions in manufacturer's packaging.

- B. Store off ground in ventilated and protected manner to prevent contamination deterioration from moisture.
- C. Handle materials with care to prevent damage or contamination

1.8 COORDINATION

- A. Coordinate this Section with other trades and sections of work, requiring attachment of components to formwork.

PART 2 PRODUCTS

2.1 GENERAL FORMWORK REQUIREMENTS

- A. Form Material: At the discretion of the Contractor subject to acceptance of the Engineer.
- B. Exposed Concrete Surfaces
 1. Construct formwork for exposed (painted or unpainted) concrete surface with smooth faced undamaged plywood or other type panel materials approved by the Engineer to provide continuous, straight, smooth as-cast surfaces.
 2. Furnish panels (plywood or other accepted panel materials) in the largest practical sizes to minimize the number of joints.
- C. Strength
 1. Provide form material with sufficient strength to withstand pressure of newly placed concrete without excessive and objectionable bow or deflection.

2.2 WOOD FORM MATERIALS

- A. Lumber Forms:
 1. Application: Use for edge forms and unexposed finish concrete.
 2. Boards: 6 inches or 8 inches in width, shiplapped or tongue and groove, "Standard" Grade Douglas Fir, conforming to WCLIB Standard Grading Rules for West Coast Lumber or approved equal.
 3. Surface boards on four sides.
- B. Plywood Forms:
 1. Application: Use for exposed finish concrete.
 2. Forms: All plywood shall conform to NIST PS 1; full size 4 x 8 feet panels; each panel labeled with grade trademark of APA/EWA.
 3. Plywood for general exposed finish concrete: Minimum of 5/8 inch thick; APA/EWA "B-B Plyform Structural I Exterior" grade.
 4. Plywood where "Smooth Finish" is required, as indicated on Contract Drawings: APA/EWA "HD Overlay Plyform Structural I Exterior" grade, minimum of 3/4 inch thick.

- C. Hardboard Forms:
1. Application: Use for lining forms for exposed finish concrete where “Smooth Finish” free from grain markings is required.
 2. Tempered smooth-one-side (SIS), minimum of 3/16 inch thick conforming to PS 58.
 3. Shingle nails or other nails with thin, flat heads and thin shanks should be used to fasten the sheets to the backup lumber.
 4. Edges of adjacent sheets shall be nailed to the same backing boards to prevent slight offsets that may accentuate joints.
 5. Joints between adjacent sheets shall be filled with plaster, putty or tape and sanded to make the joints invisible.
 6. Holes for form ties should be drilled from the face side to avoid tearing the board.
 7. The surface of the board should be oiled, and the material thoroughly wet for several hours prior to being used.

2.3 PREFABRICATED FORMS

- A. Preformed Steel Forms: Minimum 16 gage matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
- B. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.
- C. Framing, Studding and Bracing: Stud or No. 3 structural light framing grade.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify lines, levels, and centers before proceeding with formwork. Verify dimensions agree with Contract Drawings.
- B. Verify the concrete cover of all reinforcement after form placement. When formwork placement results in insufficient concrete cover over reinforcement, the formwork shall be removed and reset to maintain the required concrete cover unless otherwise directed by the Engineer.
- C. Examine the substrate and conditions under which the work of this Section is to be performed, and correct unsatisfactory conditions that would prevent proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Conform to ACI 347, except as specified herein.
- B. Initially and before re-use, forms shall be cleaned and a coat of non-staining form release agent applied per manufacturer's instructions.
 - 1. Care shall be taken to avoid splashing of oil on reinforcing steel or existing concrete.
 - 2. Do not apply form release agent where concrete surfaces are scheduled to receive special finishes which may be affected by the agent.

3.3 INSTALLATION

- A. Earth Forms:
 - 1. Earth forms are not permitted.
- B. Formwork - General:
 - 1. Construct forms complying with ACI 347, to exact sizes, shapes, lines and dimensions shown, and as required to obtain accurate alignment, location, grades, level and plumb work in finished structures.
 - 2. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces
 - 3. Forms shall be, mortar-tight, braced, and of sufficient strength to maintain shape and position under imposed loads from construction operations.
 - 4. All form joints shall be backed-up to assure that the edges of abutting panels are in the same plane, straight and true, and forced tightly together to minimize fins. The quality of the form contact surfaces shall be subject to the acceptance of the Engineer.
 - 5. Provide falsework and bracing to ensure stability of the formwork. Strengthen all formwork liable to be overstresses by construction loads.
 - 6. Provide top form for sloped surfaces steeper than 1.5 horizontal to 1 vertical to hold shape of concrete during placement, unless it can be demonstrated that top forms can be omitted.
 - 7. Camber forms where necessary to achieve ACI 301 tolerances.
 - 8. Carefully verify horizontal and vertical positions of forms. Correct misaligned or misplaced forms before placing concrete.
 - 9. Provide temporary ports in formwork to facilitate cleaning and inspection. Locate openings at the bottom of the forms to allow flushing water to drain. Close ports with tight fitting panels, flush with the inside face of the forms, neatly fitted so that the joints will not be apparent in exposed concrete.
 - 10. Provide openings for offsets, sinkages, keyways, recesses, moldings, reglets, chamfers, blocking, screeds, bulkheads, anchorages, inserts and other features required. Use selected materials to obtain required finishes.
 - 11. Form openings and construction which accommodates installation by other trades whose materials and products must be fabricated before opportunity exists to verify the measurements of adjacent construction which affects such installations, shall be accurately sized and located as dimensioned on the Contract Drawings.
In the event that deviation from the Drawing dimensions results in problems in

the field, the Contractor shall be responsible for resolution of the conditions as accepted by the Engineer, without additional expense to the Owner.

- C. Forms – Falsework and Bracing:
1. Erect formwork, shoring, and bracing to achieve design requirements, in accordance with requirements of ACI 301, 318 and 347.
 2. Erect falsework and support, brace and maintain it to safely support vertical, lateral and asymmetrical loads applied until such loads can be supported by in-place construction.
 3. Construct falsework so that adjustments can be made for take-up and settlement.
 4. Provide wedges, jacks or camber strips to facilitate vertical adjustments.
 5. Carefully inspect falsework and formwork during and after concrete placement operations to detect abnormal deflection or signs of failure; make necessary adjustments to produce work of required dimensions.
- D. Forms for Exposed Concrete
1. Drill forms to suit ties used to prevent leakage of concrete mortar around the tie holes. Do not splinter forms by driving ties through improperly prepared holes
 2. Provide sharp, clean corners at intersecting planes, without visible edges or offsets. Back joints with extra studs or girts to maintain true, square intersections.
 3. Use extra studs, walers and bracing to prevent objectionable bowing forms between studs and to avoid bowed appearance in concrete. Do not use narrow strip form material which will produce bow.
 4. Assemble forms so that they may be readily removed without damage to exposed concrete surfaces.
- E. Forms for Smooth Finish Concrete:
1. Use steel, plywood or lined board forms.
 2. Use clean and smooth plywood and form liners, uniform in size, and free from surface and edge damage capable of affecting resulting concrete finish.
 3. Install form lining with close-fitting square joints between separate sheets without springing into place.
 4. Use full size sheets of form lines and plywood wherever possible.
 5. Tape joints to prevent protrusions in concrete.
 6. Use care in forming and stripping wood forms to protect corners and edges.
 7. Level and continue horizontal joints.
 8. Keep wood forms wet until stripped.
- F. Forms for Surfaces to Receive Membrane Waterproofing: Use plywood or steel forms. After erection of forms, tape form joints to prevent protrusions in concrete.
- G. Obtain Engineer's approval before framing openings in structural members not indicated on Contract Drawings.
- H. Corner Treatment:
1. Unless shown otherwise, form 3/4" chamfers with strips on external corners of columns, walls, girders, beams, foundation walls projecting beyond overlying masonry, and other external corners that will be exposed.

2. Extend terminal edges to required limit and miter chamfer strips at changes in direction.
- I. Provisions of Other Trades:
 1. Provide openings, slots, reglets, recesses, sleeves, bolts, anchors, inserts, etc. in concrete formwork to accommodate the work of other trades.
 2. Verify sizes and location of openings, slots, recesses sleeves, bolts, anchors, inserts and chases with the trade(s) requiring such items.
 3. Accurately place and securely support items to be built into the forms.
 - J. Do not patch formwork.
- 3.4 APPLICATION - FORM RELEASE AGENT
- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
 - B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
 - C. Do not apply form release agent where concrete surfaces are indicated to receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.
 - D. Reuse and Coating of Forms: Thoroughly clean forms and reapply form coating before each reuse. For exposed work, do not reuse forms with damaged faces or edges. Apply form coating to forms in accordance with manufacturer's specifications. Do not coat forms for concrete indicated to receive "scored finish". Apply form coatings before placing reinforcing steel.
 - E. Do not allow excess form release agent to accumulate in forms or to come into contact with surfaces which will be bonded to fresh concrete.
- 3.5 INSTALLATION - INSERTS, EMBEDDED PARTS, AND OPENINGS
- A. General:
 1. Set and build into the work anchorage devices and other embedded items required for other work attached to, or supported by, cast in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of the items to be attached thereto.
 2. Those trades whose work is related to the concrete or must be supported by it shall be given ample notice and opportunity to install embedded items before the concrete is placed.
 3. Electrical conduit, junction boxes, pipes, sleeves, inserts and similar items shall be placed in the concrete in accordance with all of the requirements of the Building Code and authority having jurisdiction. Such items shall be protected to the extent they are not displaced or damaged during the placing of concrete.
 - B. Install formed openings for items to be embedded in or passing through concrete work.

CONTRACT NO. 22-523
DIVISION 3 - CONCRETE

- C. Locate and set in place items required to be cast directly into concrete.
- D. Position recessed reglets for brick veneer masonry anchors in accordance with spacing and intervals as shown or specified.
- E. Install accessories straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- F. Waterstops:
 - 1. Waterstops shall be installed so as to form a continuous watertight diaphragm without displacing reinforcement.
 - 2. Adequate provisions shall be made to support and completely protect the waterstops during the progress of the work. Waterstops shall be wire tied to the steel reinforcement to prevent movement during placement.
 - 3. Splices shall be made in conformance with the recommendations of the waterstop manufacturer.
- G. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- H. Form Ties:
 - 1. Use sufficient strength and sufficient quantity to prevent spreading of forms.
 - 2. Place ties at least 1 inch away from finished surface of concrete. Patch with cement mortar to match adjacent surface color and texture.
 - 3. Form ties for liquid containment structures shall leave no metal or other material except concrete within 1-1/2 inch of the formed surface. Patch with cement mortar to match adjacent surface color and texture.
 - 4. Leave inner rods in concrete when forms are stripped. Rods remaining in place in liquid containment structures:
 - a. Shall be provided with an integral waterstop.
 - b. Shall provide a cone shaped depression at least 1-inch in diameter and 1-1/2 inches deep to allow for filling and patching. Patch with cement mortar to match adjacent surface color and texture.
 - 5. Through ties that are to be completely removed from liquid containment structures should be tapered over the portion that passes through the concrete.
 - a. The large end of the tapered tie should be positioned on the liquid side of the wall.
 - 6. Space form ties equidistant, symmetrical and aligned vertically and horizontally unless otherwise shown on Contract Drawings.
- I. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.
- J. Joints
 - 1. Provide isolation, control, contraction, expansion and construction joints in accordance with the following.
 - 2. Continue reinforcing steel and wire fabric across construction joints where not indicated as being free to move.

CONTRACT NO. 22-523
DIVISION 3 - CONCRETE

3. Install premolded joint filler at locations shown. Extend joint filler from bottom of concrete up flush to finish concrete surfaces or hold down below finish surface as detailed.
4. Make splices in premolded filler in manner to preclude penetration of concrete between joint faces.
5. Concrete shall not be allowed to enter the joint or space for the sealant and backing rod and destroy the proper function of the joint.
6. The surface of all joints shall be thoroughly cleaned and all laitance removed by wire brushing, air or light sand blasting.
7. All joints shall be clean and free from dirt, debris before primer and sealer are applied.
8. Construction Joints:
 - a. Construction joints shall be as shown on the Contract Drawings where structural integrity is affected, otherwise, the Contractor shall submit descriptions of the joints and their locations to the Engineer of approval.
 - b. Unless otherwise shown of the Contract Drawings, construction joints shall be made and located so as not to impair the strength of the structure. Provisions shall be made for transfer of shear and other forces through the joints.
 - c. Construction joints in floors shall be located within the middle third of spans of slabs, beams and girders. Joints in girders shall be offset a minimum of two times the width of the intersecting beams.
 - d. Beams, girders, or slabs supported by columns or walls shall not be cast or erected until concrete in the walls or vertical supports members is no longer plastic
 - e. Beams, girders, haunches, drop panels, and capitals shall be placed monolithically as part of a slab system, unless otherwise shown in the Contract Drawings.
 - f. Construction joints shall be perpendicular to the main reinforcement
 - g. Construction joints in water retaining structures shall have an integral continuous waterstops extending above the waterline and stopping nine inches below the top surfaces of the concrete.
 - h. In non liquid containing structures, waterstops shall be provided at all construction joints below grade in walls or slabs that enclose an accessible area.
 - i. The maximum distance between horizontal joints in slabs and vertical joints in walls shall be 30'-0" unless otherwise indicated on the Contract Drawings.
 - j. All corners shall be part of a continuous placement.
 - k. Construction joints shall not be located closer than 5 feet from any corner.
 - l. The elapsed time between casting adjoining concrete shall be at least 48 hours.
 - m. The surfaces of all construction joints shall be prepared in accordance with the requirements of ACI 301.
 - n. Immediately before new concrete is placed, all construction joints shall be wetted and standing water removed
 - o. All construction joints shall be bonded by one of the following methods:

- 1) The use of an approved bonding agent applied in accordance with manufacturer's recommendations.
 - 2) The use of Portland cement grout of similar proportions to the concrete applied in an acceptable manner.
 - p. Install surfaced pouring strip where construction joints intersect exposed surfaces to provide straight line at joints.
 - q. Just prior to subsequent concrete placement, remove strip and tighten forms to conceal shrinkage.
 - r. Show no overlapping of construction joints. Construct joints to present same appearance as butted plywood joints.
 - s. Arrange joints in continuous line straight, true and sharp.
9. Control Joints
- a. Provide control joints as shown on the Contract Drawings
 - b. Control joints shall have a maximum spacing of 5 feet in each direction.
 - c. Form control joints by inserting prefabricated strip into fresh concrete until the top surface of the strip is flush with the surface.
 - d. After the concrete has cured for at least seven days, remove inserts and clean loose debris from the groove.
 - e. Caulk in accordance with the requirements of Section 07 92 00.
 - f. The sawcutting of control joints in lieu of forming shall not be allowed unless otherwise indicated on the Contract Drawings.
 - 1) Where allowed, joints shall be sawed within 24 hours of concrete placement.
 - 2) Sawcutting shall not take place until the concrete can support foot traffic without impressions or other surface damage.
 - g. Unless otherwise noted in the Contract Drawings, control joints shall be:
 - 1) Reinforced Concrete: 1-inch deep
 - 2) Unreinforced Concrete: 1/3 of concrete thickness.
10. Expansion Joints
- a. Provide expansion joints as shown on the Contract Drawings.
 - b. All expansion joints shall include a compressible preformed joint filler and joint sealant.
 - c. A nine inch center-bulb type waterstops shall be provided:
 - 1) For all expansion joints in water retaining structures.
 - 2) All expansion joints below grade in walls or slabs that enclose an accessible area.
 - d. Reinforcement or other embedded items bonded to the concrete (except dowels in floors bonded only on one side of a joint) shall not be permitted to extend continuously through any expansion joint.
11. Isolation Joints in slab on grade
- a. Provide isolation joints in slabs on grade at points of contact between slabs on grade and vertical surfaces where indicated
 - b. Caulk in accordance with the requirements of Section 07 92 00.
12. Sealant Slots
- a. Where premolded joint filler is held down below finished concrete face, install in the form a water-soaked wood strip of dimensions shown to form after its removal a proper sized slot to receive the sealant.

- K. Embedded Items:
1. Make provisions for pipes, sleeves, anchors, inserts, reglets, anchor slots, nailers, water stops, and other features.
 2. All pipes and sleeves passing through the concrete of liquid containing structures shall include an integral waterstop.
 3. Piping and conduit shall be so fabricated and installed that cutting, bending or displacement of reinforcement from its proper location will not be required.
 4. Do not embed wood or uncoated aluminum in concrete.
 5. Obtain installation and setting information for embedded items furnished under other Specification sections.
 6. Securely anchor embedded items in correct location and alignment prior to placing concrete.
 7. Verify conduits and pipes, including those made of coated aluminum, meet requirements of ACI 318 for size and location limitations.
 8. Locate anchor bolts as shown on the Contract Drawings and on the Shop Drawings. Obtain necessary templates as required for the proper setting of anchor bolts and other items for equipment as required.
 9. Assist other trades and Contracts in the installation of piping, pipe sleeves, conduit and similar items where such items are to be installed in concrete. Provide frames to securely hold anchor bolts and anchorage devices in place during construction, and take care that no displacement occurs during the pouring of concrete.
- L. Openings for Items Passing Through Concrete:
1. Frame openings in concrete where indicated on Contract Drawings. Establish exact locations, sizes, and other conditions required for openings and attachment of work specified under other sections.
 2. Coordinate work to avoid cutting and patching of concrete after placement.
 3. Perform cutting and repairing of concrete required as result of failure to provide required openings.
- M. Screeds:
1. Set screeds and establish levels for tops of concrete slabs and levels for finish on slabs.
 2. Slope slabs to drain where required or as shown on Contract Drawings.
 3. Before depositing concrete, remove debris from space to be occupied by concrete and thoroughly wet forms. Remove freestanding water.
- N. Scream Supports:
1. For concrete over waterproof membranes and vapor retarder membranes, use cradle, pad or base type screed supports which will not puncture membrane.
 2. Staking through membrane is not permitted.
- O. Cleanouts and Access Panels:
1. Provide removable cleanout sections or access panels at bottoms of forms to permit inspection and effective cleaning of loose dirt, debris and waste material.
 2. Clean forms and surfaces against which concrete is to be placed. Remove chips, saw dust and other debris. Thoroughly blow out forms with compressed air just before concrete is placed.

3.6 FORM CLEANING

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.
- C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
- D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.7 FORM REUSE

- A. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable and shall be replaced.

3.8 SHORES AND SUPPORTS

- A. Comply with ACI 347 for shoring and reshoring in multi-story construction, and as specified herein.
- B. Submit a shore removal and reshoring schedule and drawings for the Engineer's review before proceeding with this work.
- C. Do not proceed until the schedule and drawings have been reviewed.

3.9 FORM REMOVAL

- A. Forms shall not be removed without the permission of the Engineer. In general, forms shall not be removed until the concrete has hardened sufficiently to support its own load safely, plus any superimposed loads that might be placed thereon.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.
- D. The following schedule shall be considered the minimum period before formwork can be removed under normal conditions. Its use shall not relieve the contractor of responsibility for the safety and appearance of the structure.

CONTRACT NO. 22-523
DIVISION 3 - CONCRETE

<u>Type of Form</u>	<u>Above 60°F</u>	<u>50°- 60°F</u>	<u>40°- 50°F</u>
Columns 5' high	24 hours	36 hours	72 hours
Columns 5' – 10' high	3 days	5 days	7 days
Columns 10' or higher	5 days	7 days	10 days
Walls 5' – 10' high	24 hours	36 hours	72 hours
Walls 10' or higher	3 days	5 days	7 days
Beam Side Forms	24 hours	36 hours	72 hours
Beam Bottom Forms	14 days	18 days	21 days
Slabs up to 6' Span*	5 days	7 days	14 days
Construction Joint	24 hours	36 hours	72 hours

* For slabs more than six (6) foot span add twelve (12) hours for each additional foot over five (5) feet.

1. When the temperature to which the forms or concrete surfaces are exposed to falls below 40°F, the forms shall remain in place an additional time equal to the time of the sub-40°F exposure. If form insulation is used, concrete surface temperature shall apply.
 2. The Engineer may modify the form removal schedule if compressive tests indicate that the in-place concrete is of sufficient strength. Methods of field curing the cylinders shall simulate that of the concrete and shall be approved by the Engineer. All such tests shall be at the option and expense of the Contractor.
 3. When Type III cement or retarders are used, the form removal schedule above does not apply and may be modified by the Engineer.
- E. Immediately following the removal of the forms, the projecting ties shall be removed and all holes filled with grout flush with the wall. Care shall be taken to use the same brand of cement and same mix proportions used in the wall to prevent color differences.
- F. Care shall be taken in removing forms, wales, shoring, supports and form ties to avoid spalling or marring the concrete. Patching as may be required shall be started immediately upon removal of the forms.

3.10 ERECTION TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 301 and ACI 318.
- B. Camber slabs and beams 1/4 inch per 10 feet in accordance with ACI 301.

3.11 FIELD QUALITY CONTROL

- A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.
- B. Notify the Engineer after placement of reinforcing steel in forms, but prior to placing concrete.
- C. Schedule concrete placement to permit formwork inspection before placing concrete.

- END OF SECTION -

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SECTION 03 15 00 - CONCRETE ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Form Ties
 - 2. Chamfer Strips
 - 3. Dovetail Anchor Slots
 - 4. Concrete Inserts
 - 5. Sealant Material for Concrete Joints
 - 6. Bar Supports for Steel Reinforcement (brick and blocks not permitted)
 - 7. Waterstops
 - 8. Concrete Joints and Joint Materials
 - 9. All other concrete accessories required to complete the work.

- B. Related Sections:
 - 1. Section 03 11 13 – Structural Cast-in-Place Concrete Forming
 - 2. Section 03 30 00 – Concrete and Reinforcing Steel
 - 3. Section 03 39 00 – Concrete Curing
 - 4. Section 03 60 00 – Grout
 - 5. Section 07 92 00 – Joint Sealants

1.2 REFERENCES

- A. General Requirements:
 - 1. Except as modified by governing codes and by this Specification, comply with the applicable provisions and recommendations of latest editions of the following.
 - 2. Where the language in any of the documents referred to herein is in the form of a recommendation or suggestion, such recommendations or suggestions shall be deemed to be mandatory under this Contract unless otherwise directed by the Engineer.
 - 3. Conflicts: Conform to requirements of cited standard unless specified otherwise. In case of apparent conflict between standards, or between standards and the specifications herein, the more stringent shall apply unless otherwise directed by the Engineer.

- B. American Concrete Institute:
 - 1. ACI 117 – Standard Specifications for Tolerances for Concrete Construction and Materials.
 - 2. ACI 301 – Specifications for Structural Concrete.
 - 3. ACI 318 – Building Code Requirements for Structural Concrete.
 - 4. ACI 347 – Guide to Formwork for Concrete.

- C. American Hardboard Association

1. AHA A135.4 – Basic Hardboard

D. ASTM International:

1. ASTM D412 – Standard test Method for Vulcanized Rubber and Thermoplastic Elastomers – Tension.
2. ASTM D570 – Standard Test Method for the Water Absorption of Plastics.
3. ASTM D746 – Standards Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
4. ASTM D747 – Standard Test Method for Apparent Bending Modulus of Plastics by Means of Cantilever Beam.
5. ASTM D792 – Standard Test Method for Density and Specific Gravity of Plastics by Displacement.
6. ASTM D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
7. ASTM D1752 – Standard Specification for Preformed Sponge Rubber, Cork and Recycled PVC Expansion
8. ASTM D2240 – Standard Test Method for Rubber Property – Durometer Hardness.
9. ASTM D5249 – Backer Material for Use with cold and Hot Applied Joint Sealants in Portland Cement Concrete and Asphalt Joints.
10. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.

E. U.S. Army Corps of Engineers:

1. CRD-C-572 – Polyvinylchloride Waterstop

1.3 PERFORMANCE REQUIREMENTS

- A. Vapor Retarder Permeance: Maximum 1 perm when tested in accordance with ASTM E96, Procedure A.

1.4 SUBMITTALS

- A. Manufacturer's specifications and other data required to demonstrate compliance with the specific requirements.
- B. Manufacturer's recommended instructions for:
 1. Installing concrete accessories.
 2. Splicing non-metallic waterstops.
- C. On the concrete reinforcement and concrete formwork shop drawings clearly show in detail the locations of all concrete joints, accessories, insets and embedded items of other trades; and show details of how all joints, accessories, insets and embedded items of other trades are held in place during concrete placement.
- D. Test results from independent testing laboratories showing compliance with these specifications. Sworn affidavits or statements from suppliers are not acceptable.

CONTRACT NO. 22-523
DIVISION 3 - CONCRETE

- E. Furnish manufacturer's certification or test results identifying physical characteristics.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301, ACI 302, ACI 318, ACI 350 and ACI 347

1.6 QUALIFICATIONS

- A. Products used in the work of this section shall be produced by manufacturer's who are regularly engaged in the manufacturer and/or supply of similar items for at least five (5) years and which have a history of successful production, acceptable to the Engineer.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver concrete accessories and installation instructions in original manufacturer's packaging.
- B. Store off ground in ventilated and protected manner to prevent contamination, and deterioration from moisture.
- C. Protect from UV exposure.

1.8 COORDINATION

- A. Coordinate this Section with other sections of work, requiring attachment of components to formwork.

PART 2 PRODUCTS

2.1 FORM TIES

- A. Characteristics:
 - 1. Factory fabricated, adjustable length, removable or snapoff metal form ties, designed to prevent form deflection and to prevent spalling concrete surfaces upon removal.
 - 2. Snapoff Metal Form ties:
 - a. Snapoff metal form ties with integral waterstops shall be provided for all liquid containment structures and below grade walls which have occupied interior spaces.
 - b. Snapoff ties shall be designed so that:
 - 1) The portion remaining with the concrete after removal of exterior parts is at least 1-1/2 inches from the formed concrete surface
 - 2) A cone shaped a hole not larger than 1-inch diameter and 1-1/2 inches deep remains in the concrete surface. The minimum diameter of the hole shall not be less than 3/8 inch.
 - c. Snapoff metal form ties used with concrete formliner shall be 316 stainless steel.

CONTRACT NO. 22-523
DIVISION 3 - CONCRETE

3. The tie holes shall be filled with a cement mortar to match color and texture of the adjacent concrete surfaces.

- B. Acceptable Manufacturers:
1. Dayton Superior Concrete Accessories
 2. Or Approved equal

2.2 CHAMFER STRIPS

- A. Characteristics:
1. Type: Triangular fillets with nailing flange
 2. Material: Extruded vinyl
 3. Size: ¾-inch x ¾-inch or as indicated on the Contract Drawings.
- B. Acceptable Manufacturers:
1. Greenstreak
 2. Vinylex Waterstop & Accessories
 3. Dayton Superior Concrete Accessories
 4. Or Approved equal

2.3 DOVETAIL ANCHOR SLOTS

- A. Characteristics:
1. Dovetail anchor slot with removable foam or felt filler.
 2. Material: Galvanized steel, 22 gauge.
- B. Acceptable Manufacturers:
1. Dayton Superior Concrete Accessories
 2. Heckman Building Products Inc.
 3. Hohman & Barnard, Inc.
 4. Or Approved equal.

2.4 WATERSTOPS

- A. Polyvinylchloride (PVC) Waterstops
1. PVC material shall be compounded from virgin PVC resins and shall contain no reclaimed, reground or reworked materials. The material shall meet the following physical property requirements

Property	Test	Requirement
Tensile Strength (psi)	ASTM D412	1400 min
Ultimate Elongation (%)	ASTM D412	280 min
Hardness, Type A Durometer	ASTM D2240	65-88
Stiffness in Flexure (psi)	ASTM D747	750 min
Specific Gravity	ASTM D792	1.38 max.
Water Absorption in 48 hrs.(%)	ASTM D570	.5 max.
Low Temperature Brittleness	ASTM D746	No sign of failure @ 35°F
Accelerated Aging		

- Tensile Strength (psi)	CRD-C-572	1500 min.
- Elongation (%)	CRD-C-572	300 min
Effect of Alkali in 7 Days		
- Weight Change (%)	CRD-C-572	-.10 to +.25
- Hardness, Type A Durometer	CRD-C-572	+ 5 max.
- Tensile Strength Change (%)		-15 max.

2. Construction and Control Joints
 - a. Type: Ribbed Flat
 - b. Size: 6-inch wide x 3/8-inch thick (minimum at any point) with 5/8-inch rib and center bulb.
 - c. Head Pressure Rating: 175 ft water
 - d. Securely wired to reinforcement
 - e. Split units may be used instead of splitting the formwork.
3. Expansion Joints
 - a. Type: Ribbed with center bulb
 - b. Size: 9-inch wide x 3/8-inch thick (minimum at any point) with 1/2-inch ID, 1" OD center bulb (minimum)
 - c. Head Pressure Rating: 175 ft water
4. Acceptable Manufacturers:
 - a. No. CR-9380 and No. CR-6380 Wirestop by Paul Murphy Plastics Company;
 - b. No. RLB9 and No. RB6-38 by Vinylex;
 - c. No. 718 and No. 70S by Greenstreak;
 - d. Or Approved Equal.

B. Hydrophilic Waterstops

1. Hydrophilic waterstops shall be installed where new concrete is placed against existing concrete and watertightness is required and as shown on the Contract Drawings.
2. Hydrophilic waterstops shall be manufactured from a natural rubber product that has been chemically bonded to a hydrophilic agent. The product shall undergo expansion when exposed to moisture. The hydrophilic waterstop shall have an embedded stainless steel mesh to direct expansion in the thickness direction and restrict expansion in the longitudinal direction. The product shall develop an expansion pressure not less than 400 psi. The product shall withstand a hydraulic head pressure of a minimum of 150 feet. The product shall be suitable for use in wastewater and wastewater anaerobic sludge digester applications.
3. Physical Properties

Property	Test Method	Requirement
Hardness Hs	JIS K 6253	A30
Tensile Strength	JIS K 6251	0.9 MPa
Elongation	JIS K 6251	560 %
Specific Gravity	JIS K 6350	1.18
Change in Volume		120 %
Change in Mass		≤ 5.0 %

4. Hydrophilic waterstop shall be installed in conjunction with a hydrophilic paste. This paste shall be used to secure the hydrophilic waterstop to the surface of the concrete.
5. Install hydrophilic waterstop and hydrophilic paste in accordance with the manufacturer's recommendations.
6. Acceptable Manufacturer's
 - a. Adeka Corporation
 - 1) Waterstop: Ultra Seal MC-2010MN
 - 2) Hydrophilic Paste: Ultra Seal P-201
 - b. BBZ USA, Inc.
 - 1) Waterstop: Duroseal Gasket Type 2010
 - 2) Hydrophilic Paste: Duroseal Paste
 - c. Greenstreak
 - 1) Waterstop: Hydrotite
 - 2) Hydrophilic Paste: Leakmaster
 - d. Or Approved Equal

2.5 JOINT MATERIALS

- A. Expansion Joint Filler
 1. Characteristics
 - a. Type: Preformed, closed cell Joint Filler
 - b. Material: superior grade polyethylene, non-extruding PVC or Virgin homogeneous sponge rubber conforming to ASTM D1752, Type I. Granulated materials shall not be permitted. Where required, backer material shall conform to ASTM D 5249.
 - c. Joint filler material shall be held back for sealants.
 - d. Thickness: As required
 2. Acceptable Manufacturers
 - a. A.P. S. Cork
 - b. W.R. Meadows, Inc.
 - c. Sonolastic Expansion Joint Filler by Sonneborn
 - d. Rodofoam II by W.R. Grace
 - e. Or Approved equal
- B. Isolation Joint Filler Material
 1. Characteristics
 - a. Type: Preformed closed cell rigid foam, cork, or non-impregnated fiberboard.
 - b. Thickness: As required
 - c. Joint filler material shall be held back for sealants.
 2. Acceptable Manufacturers
 - a. Conflex LT by Masonite Corporation Building Products
 - b. Or Approved equal.
- C. Control Joint Strips
 1. Characteristics
 - a. Type: Prefabricated 1/8-inch thick tempered hardboard conforming to AHA A135.4, Class 1 In lieu of hardboard strips, rigid polyvinyl chloride

(PVC) or high impact polystyrene (HIPS) insert strips specifically designed to control cracking. Such strips shall have a removable top section.

- b. Dimensions:
 - 1) Width: 1/8 inch
 - 2) Depth:
 - a) Reinforced Concrete: 1/2-inch deep
 - b) Unreinforced Concrete: 1/3 of concrete thickness

D. Sealants:

- 1. Sealants for expansion joints in structures designed for submerged conditions to either contain or hold out liquids including groundwater such as process basins, basements, flow channels, galleries, etc. shall be polysulfide material. Sonneborn "Sonolastic - Two-Part," Tamms Industries "Hornflex," or approved equal.
- 2. Sealants for non-submerged conditions are as specified in Joint Sealants Section 07 92 00.

E. The joint fillers shall be compatible as a back-up material, with regard to the sealant not bonding to or being stained by the backup. If the joint filler is a material that will bond to the sealant, polyethylene tape or backing rods shall be used to cover the backup. The polyethylene and backing rod material shall be of a type that will not bond to the sealant.. Construction joints for interruptions in slabs on grade concrete placements shall be fabricated from 18 gage galvanized steel shaped to form a tongue-and-groove mechanical key joint. Preformed knock-out holes shall be provided. The unit shall be the same depth as the concrete. "Vulco Screed Joint II" (free flow) as made by Vulcan, "Tongue & Groove" joint #95 as made by Heckmann, "Keyed Kold Joint" as made by Burke, or approved equal.

F. Construction joints for interruptions in concrete placement in mat foundations, beam and slab systems, and walls shall be made from lumber with custom cut holes or slots to pass all reinforcing through and with standard keyway and waterstop. These "bulkheads" are to be securely fastened to the deck, wall, and/or beam forms. They shall be the same depth as the concrete section and produce dense, clean, sharp edges (top, bottom and side) when stripped.

G. A dowel and sleeve combination shall be provided at expansion joints in concrete slabs or walls as shown on the Drawings. Smooth steel dowels shall be provided with a close fitting sleeve of pipe or conduit. The plain steel dowel shall conform to ASTM A572 or A588 with 50 ksi yield strength. One end of the sleeve shall be sealed against concrete intrusion by capping, plugging or crimping. The sleeve shall provide positive means to assure 1-inch free travel of the dowel after installation. The dowel shall be lubricated with grease just prior to installation of the sleeve.

2.6 BAR SUPPORTS

A. Bar supports shall be a non-bleeding and non-staining material where concrete surfaces remain exposed. Plastic tipped or stainless steel protected bar supports shall be used for this purpose.

CONTRACT NO. 22-523
DIVISION 3 - CONCRETE

B. Bar supports bearing on grade, insulation, or soft material shall be continuous runner type supplied with continuous welded-on plates to assure proper support of reinforcing. Individual high chair supports will not be considered adequate.

C. The use of brick or block support for reinforcement shall not be permitted.

2.7 VAPOR BARRIER

A. Characteristics

1. Type: Polyethylene sheets, minimum thickness 10 mils.

2.8 MEMBRANE WATERPROOFING

A. Membrane waterproofing shall be liquid applied polyurethane elastomer.

2.9 OTHER ACCESSORIES

A. As shown or required.

PART 3 EXECUTION

3.1 GENERAL

A. Unless otherwise shown or specifies, install concrete accessories in accordance with Section 03 11 13 and Section 03 30 00.

B. Install factory fabricated products in accordance with manufacturer's printed instructions.

3.2 CHAMFER STRIPS

A. Install chamfer strips on external corners.

3.3 VAPOR BARRIER

A. Do not lay vapor barrier sheeting until immediately prior to placing of reinforcing and concrete.

B. Use the greatest widths and lengths practicable to eliminate joints wherever possible.

C. Seal all vapor barrier seams as recommended by the manufacturer.

D. Patch and seal all vapor barrier breaks as recommended by the manufacturer.

E. Do not place concrete over vapor barrier until all breaks have been patched and sealed.

F. Concrete placement must not damage vapor barrier. Place a 2-inch layer of approved damp compactable fill over vapor barrier before placing concrete.

3.4 DOVETAIL ANCHOR SLOTS

- A. Anchor slots shall be provided vertically in concrete walls where masonry walls or facing abuts work.
- B. Slots shall extend the full height of the masonry.

3.5 WATERSTOPS

- A. Installation
 - 1. Waterstops shall be installed at the locations shown to form a continuous water-tight diaphragm.
 - 2. Adequate provision shall be made to support and completely protect the waterstops during the progress of the work. Waterstops shall be wire tied to the steel reinforcement. Any waterstop punctured or damaged shall be repaired or replaced. Exposed waterstops shall be protected during application of form release agents to avoid being coated. Suitable guards shall be provided to protect exposed projecting edges and ends of partially embedded waterstops from damage when concrete placement has been discontinued.
 - 3. Splices shall be made by certified trained personnel using approved equipment and procedures.
 - 4. All waterstops shall have a minimum of 2 inches of cover.
- B. PVC Waterstop Splices
 - 1. Splices shall be made by heat sealing the adjacent waterstop edges together using a thermoplastic splicing iron utilizing a non-stick surface specifically designed for waterstop welding.
 - 2. The correct temperature shall be used to sufficiently melt without charring the plastic.
 - 3. The spliced area, when cooled, shall show no signs of separation, holes, or other imperfections when bent by hand in as sharp an angle as possible.
 - 4. Edge welding will not be permitted.
 - 5. Centerbulbs shall be compressed or closed when welding to non-centerbulb type.
 - 6. Waterstop splicing defects which are unacceptable include, but are not limited to the following:
 - a. Tensile strength less than 80 percent of parent section.
 - b. Free lap joints.
 - c. Misalignment of centerbulb, ribs, and end bulbs greater than 2 mm 1/16 inch.
 - d. Misalignment which reduces waterstop cross section more than 15 percent.
 - e. Bond failure at joint deeper than 2 mm 1/16 inch or 15 percent of material thickness.
 - f. Misalignment of waterstop splice resulting in misalignment of waterstop in excess of 13 mm in 3 m 1/2 inch in 10 feet.
 - g. Visible porosity in the weld area, including pin holes.
 - h. Charred or burnt material.
 - i. Bubbles or inadequate bonding.

- j. Visible signs of splice separation when cooled splice is bent by hand at a sharp angle.

C. Hydrophilic Waterstop Splices

- 1. Ends to be joined shall be miter cut with sharp knife or shears. The ends shall be adhered with cyanacrylate (super glue) adhesive.
- 2. When joining hydrophilic type waterstop to PVC waterstop, the hydrophilic waterstop shall be positioned as shown on the drawings. A liberal amount of a single component hydrophilic sealant shall be applied to the junction to complete the transition.

3.6 CONSTRUCTION JOINTS FOR SLABS ON GRADE

- A. Construction joints are placed in the slab where the concreting operations are concluded for the day in conformity with a predetermined joint layout (i.e., at location of control or isolation joints).
- B. If concreting is interrupted long enough at any time for the placed concrete to harden, a construction joint shall be used, the location of which shall be approved by the Engineer.
- C. If possible, construction joints should not be located nearer than 5 feet from any other joint to which they are parallel.
- D. NOTE: Foundation mats are not slabs on grade.

3.7 CONSTRUCTION JOINTS FOR SUPPORTED MEMBERS

- A. Construction joints shall be located near the middle third of spans of slabs, beams, or girders, unless a beam intersects a girder at the location, in which case joints in the girders shall be offset a distance equal to twice the width of the beam.
- B. Provisions shall be made for transfer of shear and other forces through construction joints by means of ledges, extended bars, dowels, etc.
- C. Construction joints in supported slabs shall be arranged such that the slab dimensions do not exceed a 2:1 length to width ratio. Beams, girders, or slabs supported by concrete columns or walls shall not be cast or erected until concrete in the vertical support members has an age of at least 12 hours. Beams, girders, column capitals, and haunches shall be considered as part of a slab system and shall be placed monolithically therewith

3.8 EXPANSION JOINTS

- A. Expansion joints shall be provided as shown on the Drawings.
- B. Reinforcement or other fixed items embedded or bonded into the concrete shall not be run through expansion joints.
- C. Provide appropriate expansion dowels as shown.

- D. Install waterstop.
- E. Dress edges of concrete corners to provide a smooth, uniform edge.

3.9 ISOLATION JOINTS FOR SLABS ON GRADE

- A. The floor shall be separated structurally from other building elements to accommodate differential movement.
- B. Isolation joints shall be used at junctions with walls, columns, foundations, and footings, or other points of restraint, such as drain pipes, chimneys, sumps, stairways, etc.
- C. Joint material shall be removed to the depth required for installation of the sealant.

3.10 CONTROL JOINTS IN SLABS ON GRADE

- A. Control Joints in Slabs on Grade shall be provided as shown on the Drawings.
- B. In the event none are shown or are only partially shown, no slab larger than 5 feet shall be constructed without a control joint.
- C. Joints shall be formed either with a premolded joint insert.
- D. The width of the premolded joint insert or saw cut shall be a minimum of 1/4-inch and a depth of 1-1/2 inches.
- E. The joints shall be filled with sealant.
- F. NOTE: Foundation mats with two layers of reinforcement are not slabs on grade.

3.11 CONTROL/CONSTRUCTION JOINTS IN WALLS

- A. Wall control/construction Joints shall be placed at locations as shown on the Drawings or at maximum intervals of 30 feet.
- B. Locate control joints to line up with masonry control joints as shown on the architectural drawings.
- C. Wall control joints require special V-strip chamfers on both faces as detailed on the Drawings and interruption of 50 percent of the horizontal reinforcement. The top two bars in a wall shall be uninterrupted through the joint.
- D. The joint layout shall be shown on the reinforcing shop drawings, in exposed areas carefully incorporated in the concrete finish work.
- E. When wall placements must be terminated, construction joints shall be installed in advance of the day's placement.

CONTRACT NO. 22-523
DIVISION 3 - CONCRETE

- F. Waterstops shall be installed at all control/ construction joints in tanks, flow channels, basements, roof decks, etc., which are intended to hold liquid or keep areas dry.
- G. It is the Contractor's responsibility to layout the waterstops and assure continuity of intended design.
- H. All construction joints shall be wetted immediately before new concrete placement.
- I. Joints shall be thoroughly vibrated during concrete placement.
- J. The control/construction joints shall be filled with sealant.

3.12 SEALANT

- A. Where joint filler is flush with the adjacent concrete, enough filler material shall be removed so the joint can be sealed to the specified depth.
- B. The sealant shall be installed in accordance with the manufacturer's instructions. Primer shall be applied as recommended by the manufacturer.
- C. The sealant depth shall be controlled by the use of joint-fillers or back-up materials. The back-up material shall be non-impregnated and compressible; such as backer rod.
- D. Backer rod shall be about 1/8-inch larger in diameter than the width of the joint to allow for compression.
- E. Where the depth of the joint does not permit the use of backer rod, a bond breaker (polyethylene strip) must be used to prevent bonding to the back of the joint.
- F. Sealant shall be applied to both sides of all joints where accessible.
- G. Joint wide and sealant depth:

Joint Width Inches	Sealant Depth at Midpoint
0.25 to 0.50 inches	0.25 inches
0.50 to 1.00 inches	0.375 to 0.50 inches
1.0 to 2.0 inches	3.50 inches

- END OF SECTION -

SECTION 03 30 00 – CONCRETE AND REINFORCING STEEL

PART 1 GENERAL

1.1 SUMMARY

A. Work Specified

1. Furnish all labor, materials, equipment, and incidentals required and install all concrete work complete as shown on Drawings and as specified herein.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
2. ASTM A185 - Standard Specification for Steel Welded Wire Fabric, Plain for Concrete Reinforcement
3. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
4. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field
5. ASTM C33 - Standard Specification for Concrete Aggregates
6. ASTM C94 - Standard Specification for Ready-Mixed Concrete
7. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete
8. ASTM C150 - Standard Specification for Portland Cement
9. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
10. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
11. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete
12. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete

B. American Concrete Institute (ACI):

1. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.
2. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete
3. ACI 301 - Specifications for Structural Concrete.
4. ACI 305R - Hot Weather Concreting
5. ACI 306R - Cold Weather Concreting
6. ACI 315 - Details and Detailing of Concrete Reinforcement
7. ACI 318 - Building Code Requirements for Structural Concrete.
8. ACI 347 - Guide to Formwork for Concrete.

C. Concrete Reinforcing Steel Institute (CRSI):

1. Manual of Standard Practice

- D. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.3 SUBMITTALS

- A. Reinforcing Steel Shop Drawings:
1. Prior to rebar detailing and fabrication, the Contractor shall submit his proposed joint locations and waterstop details for review. When the construction joint locations have been finalized, the Contractor shall provide the reinforcing steel fabricator with the locations of the joints and notify the steel fabricator to proceed with the reinforcing steel shop drawings.
 2. Show locations of all construction, expansion, isolation, control and other joints in the concrete work.
 3. Show detail layouts of jointing and reinforcement, including dimensions, bar sizes, openings and spacings, locations, types and quantities of reinforcing steel, bending and cutting schedules, splicing, welds, stirrup spacing, supporting and spacing devices, and similar items required for the proper construction of the work.
 4. Include the bar schedules, the individual weight of each bar, the total weight of each bar size, and the total weight on each schedule list.
 5. Manufacturer's specifications and other data required to demonstrate compliance with specific requirements.
 6. A complete bill of materials list showing all items to be furnished and installed under this Section.
- B. Product Data: Submit data for all materials and admixtures, including but not limited to the following as applicable:
1. Portland Cement: Brand and manufacturer's name.
 2. Fly ash: Brand and manufacturer's name.
 3. Aggregates: Name and location of source, and DOT test numbers.
- C. Concrete Mix Design Data:
1. Submit trial concrete mix designs, including slump, admixtures, air-entrainment, water-cement ratio, and results of 1-day, 3-day, 7-day or 28-day compressive strength tests for each concrete strength and type of concrete. Indicate what will be added at the batch plant and what will be added to the mix at the site. Alternate sources of materials require separate individual mix designs.
 2. When materials change or strengths change, additional mix designs will be submitted at the Contractor's cost.
 3. Submit separate mix designs when admixtures are required for the following:
 - a. Hot and cold weather concrete work.
 4. Identify mix ingredients and proportions, including admixtures.
 5. Identify chloride content of admixtures and whether or not chloride was added during manufacture.
- D. Test Reports:
1. Sieve analysis of fine and coarse aggregates.
 2. Standard deviation data for each proposed concrete mix based on statistical records.

3. Water-cement ratio curve for each proposed concrete mix based on laboratory tests. Give average cylinder strength test results at 7, 14 and 28 days for laboratory concrete mix designs.
 4. Field and laboratory test results.
- E. Certifications:
1. Certify admixtures used in the same concrete mix are compatible with each other and the aggregates.
- F. Detailed methods of placing concrete, including sequence of placement, type of equipment (pumps or chutes) and expected size of each placement.
- G. Concrete supplier, as well as location and type of batching plant.

1.4 QUALITY ASSURANCE

- A. If, during the progress of the work, it is impossible to secure concrete of the required workability and strength with the materials being furnished, the Owner's Representative may order such changes in proportions or materials, or both, as may be necessary to secure the desired properties. All changes so ordered shall be made at the Contractor's expense.
- B. Reinforced concrete shall comply with ACI 318.
- C. All concrete testing, which in general includes all field testing, field sampling, storage of test samples, transport of field samples, laboratory testing, documentation, and report preparation, shall be performed by the Contractor and included in the Bid. The Contractor shall use the services of a Certified Independent Testing Company to perform all of the testing, sampling, documentation, reporting and related activities.
- D. Field inspection will be performed by the Owner's Representative.
- E. The Contractor shall provide facilities necessary to obtain and handle representative samples of materials to be tested. The Contractor will be responsible for the field control of all concrete and shall reject batches for high slump, uncontrolled air entrainment or delays. Written reports shall be issued by the Contractor's Independent Testing Laboratory to the Contractor and the Owner's Representative after the testing is complete. The Contractor shall review the written reports and issue his acceptance or rejection in writing to the Owner's Representative. The Contractor is responsible for correcting all rejected work to the satisfaction of the Owner's Representative.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Reinforcing steel shall be shipped and stored with bars of the same size and shape fastened bundles with durable tags, marked in a legible manner with waterproof marking showing the same designations as shown on the submitted placing drawings. Reinforcing steel shall be free from mill scale, loose rust, dirt, grease, or other foreign matter. Store off the ground and protect from moisture, dirt, oil or other injurious contaminants.

- B. Products shall be stored in conformity with the manufacturer's recommendations.
- C. Sand, aggregates and cement shall be stored or stockpiled in conformity with the recommendations of ACI 301.

1.6 QUALIFICATIONS

- A. Welders: AWS qualified or NYS DOT certification within previous 12 months.

PART 2 PRODUCTS

2.1 GENERAL

- A. Like items of materials shall be the end products of one manufacturer in order to provide standardization for appearance, maintenance and manufacturer's service.
- B. Materials shall comply with these Specifications and any applicable State or local requirements.

2.2 MATERIALS

- A. Cement shall be domestic Portland cement conforming to ASTM C150. The allowable types of cement for each concrete class are shown in Table 1. Air entraining cements shall not be used.
- B. Fine aggregates shall be washed inert natural sand conforming to the requirements of ASTM C33.
- C. Coarse aggregate shall be a well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33, and the NYS DOT Specification. Limits of Deleterious Substances and Physical Property Requirements shall be as recommended for severe weathering regions. Gradation shall conform to Gradation Size Number 8 as presented in Table 2 of ASTM C33 Gradation Requirements for Coarse Aggregates.
- D. Water shall be potable, clean and free from injurious amounts of oils, acids, alkalis, organic matter, or other deleterious substances.
- E. Concrete admixtures shall be free of chlorides and alkalis (except for those attributable to water). When it is required to use more than one admixture in a concrete mix, the admixtures shall be from the same manufacturer. Admixtures shall be compatible with the concrete mix including other admixtures.
 - 1. Air entraining admixture shall comply with ASTM C260. Proportioning and mixing shall be in accordance with manufacturer's recommendations.
 - 2. Water reducing admixture shall comply with ASTM C494, Type A. Proportioning and mixing shall be in accordance with manufacturer's recommendations.

3. Admixtures causing retarded or accelerated setting of concrete shall not be used without written approval from the Owner's Representative. When allowed, the admixtures shall be retarding or accelerating water reducing admixtures.

F. Reinforcing steel bars shall be deformed, intermediate grade steel conforming to ASTM A615 Grade 60.

G. Tie wires for reinforcing steel shall be 16 gauge or heavier, black annealed wire.

2.3 MIXES

A. Select proportions of ingredients to meet the design strength and materials limits specified in Table 1 and to produce concrete having proper placability, durability, strength, appearance and other required properties. Proportion ingredients to produce a homogenous mixture which will readily work into corners and angles of forms and around reinforcement without permitting materials to segregate or allowing excessive free water to collect on the surface.

B. The design of each mix shall be based on standard deviation data of prior mixes with essentially the same proportions of the same constituents or, if not available, be developed by independent testing laboratory acceptable to the Owner's Representative engaged by and at the expense of the Contractor. Acceptance of mixes based on standard deviation shall be based on the modification factors for standard deviation tests contained in ACI 318. Acceptance of mixes based on laboratory tests shall be based on strengths greater than the required design strengths specified in ACI 318. The water content of the concrete mixes to be used, as determined from the curve, shall correspond to strengths 16 percent greater than the required design strength. The resulting mix shall not conflict with the limiting values for maximum water-cement ratio and net minimum cement content as specified in Table 1.

C. Compression Tests: Provide testing of the proposed concrete mix or mixes to demonstrate compliance with the compression strength requirements in conformity with the provisions of ACI 318. The proposed mix designs shall be designed to achieve an average strength as follows:

<u>28 Day Compressive Strength</u>	<u>Required Average Compressive Strength</u>
f'_c	f'_{cr}
≤ 5000 psi	$f'_c + 1200$ psi
> 5000 psi	$1.10f'_c + 700$ psi

D. Entrained air, as measured by ASTM C231, shall be as shown in Table 1.

E. Slump of the concrete as measured by ASTM C143, shall be as shown in Table 1.

F. Proportion admixtures according to the manufacturer's recommendations. Two or more admixtures specified may be used in the same mix provided that the admixtures in combination retain full efficiency and have no deleterious effect on the concrete or on the properties of each other.

TABLE 1

DESIGN STRENGTH¹	CEMENT CONTENT²	W/C³	WR⁴	SLUMP RANGE (IN)	% AIR-ENTRAINED
5,000	600	0.40 max	Yes	See 2.4	4.5 - 7.5
3,000	515	0.58 max	Yes	See 2.4	4.5 - 7.5

Notes:

1. Minimum compressive strength at 28 days.
2. Minimum cement content in lbs. per cubic yard.
3. W/C = Water-cement ratio for air-entrained concrete
4. WR = Water Reducing Admixture
5. All structural concrete shall be 5,000 PSI, unless noted otherwise.

2.4 Slump

- A. All concrete containing the high range water reducing admixture (superplasticizer) shall have a maximum slump of eight (8) inches unless otherwise directed by the Engineer. Prior to the addition of the superplasticizer, the concrete shall be tested at the job site and a slump of two (2) inches to three (3) inches shall be verified. The plasticizer may then be added to increase the slump to the approved level. No water shall be added after superplasticizer is added.
- B. All concrete not containing a high range water reducing admixture (superplasticizer) shall conform to these maximum slump values, plus or minus one (1) inch:
 1. Reinforced concrete-general 4"
 2. Non-reinforced concrete 3"
 3. Pavements, sidewalks 3"
 4. Heavy mass concrete 3"
 5. Slabs on grade 3"
 6. Floor toppings 2"
- C. The values listed above are specified as the "working limit." The average slump values shall be less than the "working limit."
- D. Tolerances shall be as per ASTM C94 except that the plus tolerance shall be limited to the "working limit." A deviation of one (1) inch shall be allowed for such occasional batches of concrete that may inadvertently exceed the "working limit". Batches of concrete with slumps exceeding the "working limit" will be rejected if the Contractor fails to comply promptly with the Engineer's instructions to reduce the slump of the concrete within the "working limit." The Contractor shall not increase mixing time, add dry materials or otherwise modify a rejected batch for the purpose of conforming to slump limits.

- E. Concrete that has been rejected for failure to meet the slump limits shall not be salvaged for use in the work. Rejected concrete shall be replaced at no additional cost to the Owner.
- F. Concrete containing the high range water reducing admixture (superplasticizer) may be given additional superplasticizer only when approved by the Engineer. If a time delay has occurred wherein the slump has decreased to a level that is significantly below the maximum approved level, additional admixture may be added to increase the slump to the maximum level, but no additional water shall be added.

2.5 MEASURING, BATCHING, MIXING AND TRANSPORTING CONCRETE

- A. Measuring, batching, mixing and transporting concrete shall conform to ASTM C94 and the requirements herein, or as otherwise approved in writing by the Owner's Representative.
- B. Ready-mixed concrete, whether produced by a concrete supplier or the Contractor shall conform to the requirements above. No hand mixing will be permitted.
- C. Admixtures shall be dispensed into the batch in conformity with the recommendations of the manufacturer of the admixtures.
- D. Concrete shall be mixed until there is a uniform distribution of the materials and shall be discharged completely before the mixer is recharged. The mixer shall be rotated at a speed recommended by the mixer manufacturer and mixing shall be continued for at least one and one-half minutes after all the materials are in the mixer. Concrete shall be placed within 1-1/2 hours of the time at which water was first added, otherwise it shall be rejected. Concrete which has been remixed or re-tempered, or to which an excess amount of water has been added, shall also be rejected.

2.6 FORMS

- A. See Specification 03 11 13 for requirements on forms.

PART 3 EXECUTION

3.1 REINFORCING STEEL

- A. Reinforcing steel shall be accurately fabricated to the dimensions shown. Bars shall be bent around a revolving collar having a diameter of not less than that recommended in ACI 318. All bars shall be bent cold.
- B. Unless otherwise shown, splices in reinforcing steel shall be lapped not less than 24 diameters. All bar splices shall be staggered wherever possible. When splicing bars of different diameters, the length of lap is based on the larger bar.
- C. Before being placed in position, reinforcement shall be thoroughly cleaned of loose mill and rust scale, dirt and other coatings, including ice, that reduce or destroy bond. Where

there is a delay in depositing concrete after the reinforcement is in place bars shall be re-inspected and cleaned when necessary.

- D. Reinforcement, which is to be exposed for a considerable length of time after being placed, shall be given a heavy coat of cement grout.
- E. In no case shall any reinforcing steel be covered with concrete until the amount and position of the reinforcements have been checked by the Owner’s Representative and his permission given to proceed with the concreting.
- F. Maintain concrete cover around reinforcement as follows:

Reinforcement Location		Minimum Concrete Cover Inches	
Concrete cast against and permanently exposed to earth		3	
Concrete exposed to earth, weather or work mat slab	Slabs and Joists; Beams and Columns-Stirrups, Spirals and Ties Walls; Footings and Base Slabs-Formed Surfaces and Top of Footings and Base Slabs	2	
	Beams and Columns-Primary Reinforcement	2	
Concrete not exposed to earth or in contact with earth	Slabs	No. 11 and smaller	1
	Columns	Stirrups, Spirals and Ties	1-1/2
	Columns	Primary Reinforcement	2
	Walls	No. 11 and smaller	1
Concrete exposed to water or sewerage	Slabs, walls	3	

3.2 INSPECTION AND COORDINATION

- A. The batching, mixing, transporting, placing and curing of concrete shall be subject to the inspection of the Owner’s Representative at all times. The Contractor shall advise the Owner’s Representative of his/her readiness to proceed at least 24 hours prior to each concrete placement. The Owner’s Representative will inspect the preparations for concreting including the preparation of previously placed concrete, the reinforcing and the alignment, cleanliness and tightness of formwork. No placement shall be made without the inspection and acceptance of the Owner’s Representative.

3.3 CONCRETE APPEARANCE

- A. Concrete mix showing either poor cohesion or poor coating of the coarse aggregate with paste shall be remixed. If this does not correct the condition, the concrete shall be rejected.
- B. Concrete for the work shall provide homogeneous structure which, when hardened, will have the required strength, durability and appearance. Mixtures and workmanship shall be such that concrete surfaces, when exposed, will require no finishing. When concrete surfaces are stripped, the concrete when viewed in good lighting from 10-feet away shall be pleasing in appearance, and at 20-feet shall show no visible defects.

3.4 PLACING AND COMPACTING

- A. No concrete shall be placed until forms, condition of subgrade and method of placement have been approved the Owner's Representative. Before depositing concrete, all debris, foreign matter, dirt and water shall be removed from the forms. The contact surface between concrete previously placed and new concrete shall be cleaned and brushed with cement paste. Concrete except as indicated shall not be placed in water or submerged within 24 hours after placing, nor shall running water be permitted to flow over the surface of fresh concrete within four days after its placing.
- B. Deposit concrete as near its final position as possible to avoid segregation due to re-handling or flowing. Pumping of concrete will be permitted when an approved design mix and aggregate sizes, suitable for pumping, are used. Do not deposit concrete that has partially hardened or has been contaminated by foreign materials. If the section cannot be placed continuously, place construction joist as specified or as approved. Place concrete for walls using tremie tubes in 12-inch to 24-inch lifts, keeping the surface horizontal. Do not drop concrete more than 4-feet.
- C. High frequency mechanical vibrators shall be used to the extent necessary to obtain proper consolidation of the concrete, but not to move or transport concrete in the forms. Care shall be taken to avoid segregation of aggregates by excess vibration. Vibration shall continue until the frequency returns to normal, trapped air ceases to rise and the surface appears liquefied, flattened and glistening. Concrete adjacent to forms and around pipe stubs shall be carefully spaded or rodded.

3.5 CURING AND PROTECTION

- A. Protect all concrete work against injury from the elements and defacements of any nature during construction operations.
- B. Concrete that is to be used for the containment of water shall be water cured. Water curing shall be by ponding, by continuous sprinkling or by covering with continuously saturated burlap. Other concrete shall be cured by either water curing, sheet material curing or liquid membrane curing compound except that liquid membrane curing compound shall not be used on any concrete surface where additional concrete is to be placed or where the concrete surface is to be coated or painted.

- C. Finished surfaces and slabs shall be protected from the direct rays of the sun to prevent checking and crazing.
- D. Concrete placed during cold weather shall be batched, delivered, placed, cured and protected in compliance with the recommendations of ACI 306R. Salt, manure or other chemical shall not be used for cold weather protection.
- E. Concrete placed during hot weather shall be batched, delivered, placed, cured and protected in compliance with the recommendations of ACI 305R. The temperature of the concrete shall be such that it will cause no difficulties from loss of slump, flash set or cold joints. The Contractor shall immediately cover plastic concrete with sheet material during hot weather.

3.6 FIELD TESTS

- A. All required field and laboratory tests shall be at the Contractor's expense. Should any additional tests be necessary due to inadequate test results (e.g., core testing, load testing, etc.), the Contractor shall also be responsible for the cost. The Contractor shall use only an approved commercial testing laboratory.
- B. Sets of five (5) field control cylinder specimens will be taken by the Independent Testing Laboratory during the progress of the work, in compliance with ASTM C31. The number of sets of concrete test cylinders taken of each class of concrete placed each day shall not be less than one set, nor less than one set for each 50 cu yd of concrete. One (1) cylinder shall be broken at seven days, three (3) cylinders shall be broken and their strengths averaged at 28 days, and one (1) cylinder shall be broken at 56 days. When the average 28 day compressive strength of the cylinders in any set fall below the required compressive strength or below proportional minimum seven-day strengths (where proper relation between seven and 28 day strengths have been established by tests); the Owner's Representative may reject the concrete represented by the set of cylinders, may require modification of the concrete and/or require modification of the proportions, water content, or temperature conditions of the design mix to achieve the required strengths.
- C. The Contractor shall cooperate in the making of tests by allowing free access to the work for the selection of samples, providing an insulated closed curing box for specimens, affording protection to the specimens against injury or loss through his/her operations and furnishing material and labor required for the purpose of taking concrete cylinder samples.
- D. Slump tests shall be made in the field by the Testing Laboratory in conformity with ASTM C143.
- E. Tests for air content shall be made by the Testing Laboratory in compliance with either the pressure method complying with ASTM C231 or by the volumetric method complying with ASTM C173.

3.7 STRIPPING AND FINISHING CONCRETE

- A. Forms shall not be stripped before the concrete has attained a strength of at least 30 percent of the ultimate design strength, except as otherwise specified. This is equivalent to approximately “100 day-degrees” of moist curing.
- B. Care shall be exercised to prevent damaging edges or obliterating the lines of chamfers, rustications or corners when removing the forms or doing any other work adjacent thereto.
- C. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete, to the satisfaction of the Owner’s Representative.
- D. As soon as forms have been stripped, form ties, if employed shall be removed, and the recess filled with non-shrink grout. Any defects in the surface of the walls shall be chipped out and repaired in a workmanlike manner. Defective concrete where it occurs shall be cut to a minimum depth of 1-inch, thoroughly roughened and neat cement brushed in. The hole shall then be filled with mortar in the proportion of 1 part cement and 2-1/2 parts sand. Mortar for filling form tie recesses shall be mixed to a slightly damp consistency (just short of “balling”), pressed into the recess until dense, and troweled smooth. Mortar in larger patches shall be applied and allowed to assume a partial set following which it shall be struck off flush with the adjoining surface. Patches shall be kept moist for several days to assure proper curing.

- END OF SECTION -

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SECTION 03 39 00 - CONCRETE CURING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concrete curing and protection during cold weather conditions.
 - 2. Concrete curing and protection during hot weather conditions.
 - 3. Wet curing and protection for all slabs and walls during normal weather conditions.
- B. Related Sections:
 - 1. Section 03 11 13 – Structural Cast-in-Place Concrete Forming
 - 2. Section 03 30 00 – Concrete and Reinforcing Steel
 - 3. Section 03 15 00 – Concrete Accessories

1.2 REFERENCES

- A. General Requirements:
 - 1. Except as modified by governing codes and by this Specification, comply with the applicable provisions and recommendations of latest editions of the following.
 - 2. Where the language in any of the documents referred to herein is in the form of a recommendation or suggestion, such recommendations or suggestions shall be deemed to be mandatory under this Contract unless otherwise directed by the Engineer.
 - 3. Conflicts: Conform to requirements of cited standard unless specified otherwise. In case of apparent conflict between standards, or between standards and the specifications herein, the more stringent shall apply unless otherwise directed by the Engineer.
- B. American Concrete Institute:
 - 1. ACI 301 – Specifications for Structural Concrete.
 - 2. ACI 302 – Guide for Concrete Floor and Slab Construction
 - 3. ACI 305R – Hot Weather Concreting
 - 4. ACI 306R – Cold Weather Concreting
 - 5. ACI-308.1 – Standard Specification for Curing Concrete
 - 6. ACI-308R – Guide to Curing Concrete
 - 7. ACI 318 – Building Code Requirements for Structural Concrete.
- C. ASTM International:
 - 1. ASTM C171 – Standard Specification for Sheet Materials for Curing Concrete.
 - 2. ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

1.3 SUBMITTALS

- A. Manufacturer's specifications and other data required to demonstrate compliance with the specific requirements.
- B. Manufacturer's recommended instructions for:
 - 1. Curing compound application.
- C. Material Safety Data Sheets.
- D. Test results from independent testing laboratories showing compliance with these specifications. Sworn affidavits or statements from suppliers are not acceptable.
- E. Furnish manufacturer's certification or test results identifying physical characteristics.
- F. Proposed curing methods and procedures.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301, ACI 302, ACI 308.1, ACI 308R, ACI 318 and ACI 347.
- B. Quality Control Data
 - 1. Curing Compound:
 - a. Manufacturer's Certification of Compliance, to include statement that product meets ASTM C 309.
 - b. Permeability requirement.
 - c. Coverage.
 - 2. Curing method, procedures and method of application to be used shall be in compliance with the requirements of this Specification.

1.5 QUALIFICATIONS

- A. Products used in the work of this section shall be produced by manufacturer's who are regularly engaged in the manufacturer and/or supply of similar items for at least five (5) years and which have a history of successful production, acceptable to the Engineer.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery:
 - 1. Deliver materials to site in manufacturer's original, unopened containers and packaging.
 - 2. Packaging shall be provided, with labels clearly identifying product name and manufacturer.
- B. Storage:
 - 1. Store materials in a clean, dry area in accordance with manufacturer's instructions
 - 2. Keep containers sealed until ready for use.

- C. Handling:
 - 1. Protect materials during handling and application to prevent damage or contamination.

PART 2 PRODUCTS

2.1 CURING AND SEALING COMPOUNDS

- A. Characteristics:
 - 1. Curing compounds shall be used only during cold weather conditions.
 - 2. Curing compounds shall be dissipating, VOC-compliant, water-based, liquid membrane-forming, including a fugitive dye.
 - 3. Compounds shall conform to ASTM C309, Type 1.
 - 4. Compounds shall have a minimum thirty (30) percent solids content
 - 5. Maximum moisture loss shall be 0.03 grams per square centimeter when applied at a coverage rate of 300 square feet per gallon
- B. Acceptable Manufacturers
 - 1. SYMONS Corporation Resi-Chem Clear Cure ID,
 - 2. Tamms Industries Horncure WB 300,
 - 3. Or Approved Equal.

PART 3 EXECUTION

3.1 PREPARATION

- A. All freshly placed concrete shall be protected from adverse weather elements and from defacement. As soon as the concrete has been placed and horizontal top surfaces have received their required finish, provision shall be made for providing sufficient water for hydration and preventing loss of moisture from the concrete for at least a seven-day period.
- B. The requirements of hot and cold weather concreting being taken into account.

3.2 HOT WEATHER CURING AND PROTECTION

- A. The Contractor shall conform to ACI 305R when concreting during hot weather except as modified below.
- B. Definition of Hot Weather - When air temperatures exceed 85 degrees F, or when extremely dry conditions exist even at moderate temperatures, particularly if accompanied by high winds, the Contractor and his concrete supplier shall exercise precautionary measures in preparing, delivering, placing, finishing, curing, and protecting the concrete.
- C. Curing and protection of the concrete shall begin immediately after completion of the finishing operation.

- D. Wet curing shall be used for all slab and wall concrete.
- E. Formwork may be left in place during the entire seven-day curing period, provided that the forms remain tight and soaker hoses are placed on top of the exposed concrete surfaces. If the formwork is either loosened or removed prior to the end of the seven-day curing period, the concrete must be continuously wetted down and covered with white polyethylene.

3.3 COLD WEATHER CURING AND PROTECTION

- A. The Contractor shall conform to ACI 306R when concreting during cold weather except as modified below.
- B. Definition of Cold Weather – When the air temperature has fallen to, or expected to fall below 40 degrees F during the protection period. The protection period is defined as the time required to prevent concrete from being affected by exposure to cold weather and as determined in the table below.

Type of Member	Service Category	Temperature Range	Type I or II Cement (Days)
Fill Concrete	2	50°F - 70°F	3
Slab on Grade	3	50°F - 70°F	6
Slab on Deck	3	50°F - 70°F	6
Columns	3	50°F - 70°F	6
Walls	3	50°F - 70°F	6
Walls (note 1)	4 (note 2)	50°F - 70°F	21 (note 4)
Beams	4 (note 2)	50°F - 70°F	21 (note 4)
Slabs (other)(note 4)	4 (note 2)	50°F - 70°F	21 (note 4)

- (1) Refers to walls that are to be service loaded (water tested or backfilled) soon after concrete placement.
- (2) Formwork shall remain in place until the end of the protection period for Service Category 4 structural members.
- (3) All other structural slabs supported by temporary formwork.
- (4) Protection period could be shortened based on concrete achieving at least 75 percent of the required design strength as determined by testing of field-cured cylinder.

- C. The methods of protecting the concrete shall be such as will prevent drying. Labor, equipment, and materials necessary for winter protection and heating shall be on the site in sufficient quantity before the work begins.
- D. Suitable means shall be provided for maintaining the deposited concrete within the temperature range as defined above.
- E. Heating may be provided by using a vented heating unit, insulated blankets, or a combination of both.
 - 1. If blankets are to be used, they should be applied to the concrete as specified in ACI 306R, Chapter 7, Charts 7.3.1-7.3.4. Special attention should be given to

corners and edges of concrete members which could require about three times the thickness of insulation to maintain concrete temperature, as might be required for interior spaces. Also note, that excessive amounts of blankets could raise the temperature of the concrete too high which could cause an increase of thermal shrinkage and cause cracking due to thermal shock.

2. Where heated enclosures are provided, vent flue gases from combustion heating units to the outside of the enclosure. Place and direct heaters to avoid areas of overheating or drying of the concrete surface. Exposed concrete surfaces must be protected and cured. Where continuous moist curing is not practical, tightly adhered polyethylene or curing compounds shall be used.

F. Interruptions to the Curing and Protection Period

1. Measures shall be taken to assure the concrete temperatures will not drop below 32 degrees F.
2. Interrupted time must be made up in accordance with ACI 306R-88, Section 7.7 on a degree-hour basis.

- G. After the required protection period listed in the above table, concrete shall have curing coverings removed and be allowed to gradually dry out prior to lowering temperatures to freezing as described in the table below:

Least Dimension of Section, Inches	Minimum Gradual Decrease in Surface Temperature During any 24 hour Period of Protection, degrees F
Less than 12	50
12 to less than 36	40
36 to 72	30
Greater than 72	20

- H. Complete removal of curing compounds will be required prior to application of coatings or other toppings. A light abrasive blast or other mechanical means will be required.

I. Monitoring of Concrete Temperatures

1. In order to better follow the Contractor's cold weather procedures, various thermometers (supplied and maintained by the Contractor) shall be placed along concrete members that are undergoing cold weather protection, particularly at corners and edges of concrete members where it is more difficult to maintain the required temperature.
2. Contractor monitoring of these temperatures must be done throughout the day so that the Contractor can make timely adjustments to maintain an even temperature.
3. Access to these thermometers must be made available for the inspector to perform spot-checking of the Contractor's effectiveness to achieve proper cold weather protection.

4. The Contractor shall provide the proper type and sufficient quantity of thermometers to determine the temperature of the concrete.

3.4 NORMAL WEATHER CURING AND PROTECTION

- A. Definition of Normal Conditions - All conditions not defined as either hot or cold weather.
- B. Slabs, Curbs, Sidewalks, Toppings, and other Flatwork:
 1. After finishing and immediately after the concrete surface has hardened enough to prevent dilution of the cement paste, provide continuous moist curing for at least the first 24 hours.
 2. After the initial 24-hour period, cover for an additional six days with waterproof paper or white polyethylene.
 3. Wet burlap coverings may be used but must be kept wet by continuous sprinkling with water. Lap the cover material at least 12 inches, covering the top and sides of the concrete. The covering shall be weighted down to prevent it from blowing off.
 4. If cover material is not used, the concrete surfaces shall be kept continuously wet by spraying or other approved methods.
- C. Walls and Columns
 1. Immediately after the concrete surface has hardened enough to prevent dilution of the cement paste, provide continuous moisture at the top of the formed surface for at least the first 24 hours.
 2. If forms are left in place for the 7-day cure, the forms shall be loosened only after 24 hours to allow water to soak the sides of the concrete continuously over the next remaining 6 days.
 3. If forms are removed in less than seven days, all vertical surfaces shall be:
 - a. Sprayed with water and tightly sealed with white polyethylene or
 - b. Covered with burlap combined with a continuous water spray.If forms are removed, either a. or b. shall be followed for the remainder of the seven-day period.
- D. Interruptions, not to exceed a total of four hours are permitted for the purpose of layout, shoring or reshoring or other required construction needs as long as the surface is not allowed to completely dry. The Contractor shall be prepared to spray the exposed surface every 15 to 30 minutes.

- END OF SECTION -

SECTION 034900 - GLASS-FIBER-REINFORCED CONCRETE (GFRC)

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 glass-fiber-reinforced concrete (GFRC) panels consisting of GFRC, panel frames, anchors, and connection hardware.
 - 1. GFRC panels include column bases.
- B. Related Requirements:
 - 1. Section 079200 "Joint Sealants" for elastomeric joint sealants and sealant backings.

1.3 DEFINITIONS

- A. Design Reference Sample: Sample of GFRC color, finish, and texture to be approved by Architect before execution of the Contract.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Playland Park, RYE, New York.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include GFRC design mixes.
- B. Shop Drawings: Show fabrication and installation details for GFRC panels including the following:
 - 1. Panel elevations, sections, and dimensions.
 - 2. Thickness of facing mix, GFRC backing, and bonding pads for typical panels.
 - 3. Finishes.
 - 4. Joint and connection details.
 - 5. Erection details.
 - 6. Panel frame details for typical panels including sizes, spacings, thicknesses, and yield strengths of various members.
 - 7. Locations and details of connection hardware attached to structure.
 - 8. Sizes, locations, and details of flex, gravity, and seismic anchors for typical panels.
 - 9. Other items sprayed into panels.

CONTRACT No. 22-523
DIVISION 3 - CONCRETE

10. Erection sequence for special conditions.
 11. Relationship to adjacent materials.
 12. Description of loose, cast-in, and field hardware.
- C. Samples for Verification: For each type of finish indicated on exposed GFRC surfaces, representative of finish, color, and texture variations expected approximately 12 by 12 inches (305 by 305 mm) by actual thickness.
- D. Delegated-Design Submittal: For GFRC panels, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Welding certificates: N/A
- C. Steel Sheet Certificates: N/A
- D. Mill Certificates: N/A
- E. Source Quality-Control Program: For GFRC manufacturer.
- F. Source Quality-Control Test Reports: For GFRC, inserts, and anchors.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Designated a PCI-certified plant for Group G - Glass Fiber Reinforced Concrete.
- B. Installer Qualifications: Manufacturer of GFRC panels.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," and AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- D. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
 1. Build mockup of column base area as shown on Drawings.
 - a. Include typical components, attachments to building structure, and methods of installation.
 - b. Include sealant-filled joint complying with requirements in Section 079200 "Joint Sealants."
 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

CONTRACT No. 22-523
DIVISION 3 - CONCRETE

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Handle and transport GFRC panels supported on non staining material and with non staining resilient spacers between panels.
- B. Store GFRC panels off of ground on firm, level, and smooth surfaces supported on non staining material and with non staining resilient spacers between panels. Place stored panels so identification marks are clearly visible.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements.
 - 1. David Kucera INC.42 Steve's Lane, Gardiner, NY 12525 used as basis of design.
- B. Source Limitations: Obtain GFRC panels from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design GFRC panels, including panel frames, anchors, and connections.
- B. Structural Performance: GFRC panels, including panel frames, anchors, and connections, shall withstand the following design loads as well as the effects of thermal- and moisture-induced dimensional changes within limits and under conditions indicated:
 - 1. Loads: N/A
 - 2. Dead Loads: N/A
 - 3. Live Loads: N/A
 - 4. Wind Loads: N/A
 - 5. Seismic Loads: N/A
 - 6. Project-Specific Loads: N/A
 - 7. Deflection Limits: N/A
 - 8. Thermal Movements: Provide for thermal movements resulting from annual ambient temperature changes of **120 deg F (67 deg C)**.
 - 9. Design panel frames and connections to accommodate deflections and other building movements.
 - 10. Design panel frames to transfer window loads to building structure: N/A
- C. PCI Manuals: Comply with requirements and recommendations in the following PCI manuals unless more stringent requirements are indicated:
 - 1. PCI MNL 128, "Recommended Practice for Glass Fiber Reinforced Concrete Panels."
 - 2. PCI MNL 130, "Manual for Quality Control for Plants and Production of Glass Fiber Reinforced Concrete Products."

CONTRACT No. 22-523
DIVISION 3 - CONCRETE

- D. AISI Specifications: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- E. AISC Specifications: Comply with AISC 360, "Specification for Structural Steel Buildings."

2.3 MOLD MATERIALS

- A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that provides continuous GFRC surfaces within tolerances; nonreactive with GFRC and capable of producing required finish surfaces.
 - 1. Mold-Release Agent: Commercially produced liquid-release agent that does not bond with, stain, or adversely affect GFRC surfaces and does not impair subsequent surface or joint treatments of GFRC.
- B. Form Liners: Units of face design, texture, arrangement, and configuration indicated to match GFRC design reference sample. Provide solid backing and form supports to ensure that form liners remain in place during GFRC application. Use with manufacturer's recommended liquid-release agent that does not bond with, stain, or adversely affect GFRC surfaces and does not impair subsequent surface or joint treatments of GFRC.
- C. Surface Retarder: Chemical liquid-set retarder capable of temporarily delaying hardening of newly placed GFRC face mix to depth of reveal specified.

2.4 GFRC MATERIALS

- A. Portland Cement: ASTM C150/C150M; Type I, II, or III.
 - 1. For surfaces exposed to view in finished structure, use white of same type, brand, and source throughout GFRC production.
- B. Metakaolin: ASTM C618, Class N.
- C. Glass Fibers: Alkali resistant, with a minimum zirconia content of 16 percent, 1 to 2 inches (25 to 50 mm) long, specifically produced for use in GFRC, and complying with ASTM C1666/C1666M.
- D. Sand: Washed and dried silica, complying with composition requirements in ASTM C144; passing a No. 20 (0.85-mm) sieve with a maximum of 2 percent passing a No. 100 (0.15-mm) sieve.
- E. Facing Aggregate: ASTM C33/C33M, except for gradation, and PCI MNL 130, 1/4-inch (6-mm) maximum size.
 - 1. Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match sample.
 - 2. Fine Aggregate: Natural or manufactured sand with a maximum of 5 percent passing a No. 100 (0.15-mm) sieve and a maximum of 3 percent passing a No. 200 (0.075-mm) sieve.

CONTRACT No. 22-523
DIVISION 3 - CONCRETE

- F. Coloring Admixture: ASTM C979/C979M, synthetic mineral-oxide pigments or colored water-reducing admixtures, temperature stable, nonfading, and alkali resistant.
- G. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of GFRC and complying with chemical limits in PCI MNL 130.
- H. Polymer-Curing Admixture: Acrylic thermoplastic copolymer dispersion complying with PCI MNL 130.
- I. Air-Entraining Admixture: ASTM C260/C260M, containing not more than 0.1 percent chloride ions.
- J. Chemical Admixtures: ASTM C494/C494M, containing not more than 0.1 percent chloride ions.

2.5 ANCHORS, CONNECTORS, AND MISCELLANEOUS MATERIALS

- A. Stainless-Steel Plates: ASTM A240/A240M or ASTM A666, Type 304.
- B. Carbon-Steel Shapes and Plates: ASTM A36/A36M, finished as follows:
 - 1. Finish: Zinc coated by hot-dip process according to ASTM A123/A123M, after fabrication, or ASTM A153/A153M, as applicable.
 - 2. Finish: Shop primed with paint complying with MPI#79 on surfaces prepared to comply with SSPC-SP 2, "Hand Tool Cleaning," or better.
- C. Stainless-Steel Bars and Shapes: ASTM A276, Type 304.
- D. Carbon-Steel Bars: ASTM A108, Grade 1018, not less than 1/4 inch (6 mm) in diameter, finished as follows:
 - 1. Finish: Zinc coated by hot-dip process according to ASTM A123/A123M, after fabrication, or ASTM A153/A153M, as applicable.
 - 2. Finish: Shop primed with paint complying with MPI#79 on surfaces prepared to comply with SSPC-SP 2, "Hand Tool Cleaning," or better.
- E. Malleable-Iron Castings: ASTM A47/A47M, Grade 32510 (Grade 22010).
- F. Carbon-Steel Castings: ASTM A27/A27M, Grade 60-30 (Grade 415-205).
- G. Bolts: ASTM A307 (ASTM F568M) or ASTM F3125/F3125M, Grade A325 (Grade A325M) finished as follows:
 - 1. Finish: Zinc coated by hot-dip process according to ASTM A123/A123M, after fabrication, and ASTM A153/A153M, as applicable.
- H. Reglets: PVC extrusions

2.6 PANEL FRAME MATERIALS

- A. Cold-Formed Steel Framing: Manufacturer's standard C-shaped steel studs, complying with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members," with minimum uncoated steel thickness of 0.053 inch (1.35 mm) of web depth indicated; with stiffened flanges, U-shaped steel track; and of the following steel sheet:
 - 1. Metallic-Coated Steel Sheet: ASTM A653/A653M, structural-steel sheet, **G90 (Z275)** zinc coating, of grade required by structural performance of framing.
 - 2. Painted, Nonmetallic-Coated Steel Sheet: ASTM A1011/A1011M, hot rolled; or ASTM A1008/A1008M, cold rolled; nonmetallic coated according to ASTM A1003/A1003M; of grade required by structural performance of framing.
- B. Hollow Structural Sections: Steel tubing, ASTM A500/A500M, Grade B, or ASTM A513, finished as follows:
 - 1. Finish: Shop primed with organic zinc-rich primer complying with SSPC-Paint 20 on surfaces prepared to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Finish: Shop primed with paint complying with MPI#79 on surfaces prepared to comply with SSPC-SP 2, "Hand Tool Cleaning," or better.
- C. Steel Channels and Angles: ASTM A36/A36M, finished as follows:
 - 1. Finish: Shop primed with organic zinc-rich primer complying with SSPC-Paint 20 on surfaces prepared to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Finish: Shop primed with paint complying with MPI#79 on surfaces prepared to comply with SSPC-SP 2, "Hand Tool Cleaning," or better.

2.7 GFRC MIXES

- A. Mist Coat: Portland cement, sand slurry, and admixtures; of same proportions as backing mix without glass fibers.
- B. Face Mix: Proportion face mix of Portland cement, sand, facing aggregates, and admixtures to comply with design requirements.
- C. Backing Mix: Proportion backing mix of Portland cement, glass fibers, sand, and admixtures to comply with design requirements. Provide nominal glass-fiber content of not less than 5 percent by weight of total mix.
- D. Polymer-Curing Admixture: 6 to 7 percent by weight of polymer-curing admixture solids to dry Portland cement.
- E. Air Content: 8 to 10 percent; ASTM C185.
- F. Coloring Admixture: Not to exceed 10 percent of cement weight.

2.8 PANEL FRAME FABRICATION

- A. Fabricate panel frames and accessories plumb, square, true to line, and with components securely fastened.
 - 1. Fabricate panel frames using jigs or templates.
 - 2. Cut cold-formed metal framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed metal framing members by welding. Comply with AWS D1.3/D1.3M.
 - 4. Fasten framing members of hollow structural sections, steel channels, or steel angles by welding. Comply with AWS D1.1/D1.1M.
 - 5. Weld anchors to panel frames.
- B. Reinforce framing assemblies, as necessary, to withstand erection stresses.
- C. Galvanizing Repair: Touch up damaged galvanized surfaces according to ASTM A780/A780M.
- D. Painting Repair: Touch up damaged painted surfaces using same primer.

2.9 MOLD FABRICATION

- A. Construct molds that result in finished GFRC complying with profiles, dimensions, and tolerances indicated, without damaging GFRC during stripping. Construct molds to prevent water leakage and loss of cement paste.
 - 1. Coat contact surfaces of molds with form-release agent.
 - 2. Coat contact surfaces of molds with surface retarder.
- B. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during GFRC application. Coat form liner with form-release agent.
- C. Locate, place, and secure flashing reglets accurately.

2.10 GFRC FABRICATION

- A. Proportioning and Mixing: For backing mix, meter sand/cement slurry and glass fibers to spray head at rates to achieve design mix proportions and glass-fiber content according to PCI MNL 130 procedures.
- B. Spray Application: Comply with general procedures as follows:
 - 1. Spray mist coat over molds to a nominal thickness of 1/8 inch (3 mm) on planar surfaces.
 - 2. Spray or place face mix in thickness indicated on Shop Drawings.
 - 3. Proceed with spraying backing mix before face mix or mist coat has set, using procedures that produce a uniform thickness and even distribution of glass fibers and matrix.
 - 4. Consolidate backing mix by rolling or other technique to achieve complete encapsulation of glass fibers and compaction.
 - 5. Measure thickness with a pin gage or other acceptable method at least once for every 5 sq. ft. (0.5 sq. m) of panel surface. Take no fewer than six measurements per panel.

CONTRACT No. 22-523
DIVISION 3 - CONCRETE

- C. Hand form and consolidate intricate details, incorporate formers or infill materials, and overspray before material reaches initial set to ensure complete bonding.
- D. Attach panel frame to GFRC before initial set of GFRC backing, maintaining a minimum clearance of 1/2 inch (13 mm) from GFRC backing, and without anchors protruding into GFRC backing.
- E. Build up homogeneous GFRC bonding pads over anchor feet, maintaining a minimum thickness of 1/2 inch (13 mm) over tops of anchor feet, before initial set of GFRC backing. Measure bonding pad thickness at 25 percent of anchor locations.
- F. Inserts and Embedments: Build up homogeneous GFRC bosses or bonding pads over inserts and embedments to provide enough anchorage and embedment to comply with design requirements.
- G. Curing: Employ initial curing method that ensures sufficient strength for removing units from mold. Comply with PCI MNL 130 procedures.
 - 1. Keep moisture off of the surfaces of mixes with polymer curing admixtures during the first three hours of curing. Maintain temperature between 60 and 120 deg F (16 and 49 deg C) during the first 16 hours.
 - 2. Prevent drying of moist curing mixes during the first 24 hours. Maintain units in surface-damp condition at a temperature above 60 deg F (16 deg C) and 95 percent relative humidity for seven days.
- H. Panel Identification: Mark each GFRC panel to correspond with identification mark on Shop Drawings. Mark each panel with its casting date.

2.11 FABRICATION TOLERANCES

- A. Manufacturing Tolerances: Manufacture GFRC panels so each finished unit complies with PCI MNL 130 for dimension, position, and tolerances.
- B. Manufacturing Tolerances: Manufacture GFRC panels so each finished unit complies with the following dimensional tolerances. For dimensional tolerances not listed below, comply with PCI MNL 130.
 - 1. Overall Height and Width of Units, Measured at the Face Adjacent to Mold: As follows:
 - a. 10 feet (3 m) or less, plus or minus 1/8 inch (3 mm).
 - b. More than 10 feet (3 m), plus or minus 1/8 inch per 10 feet (3 mm per 3 m); 1/4 inch (6 mm) maximum.
 - 2. Edge Return Thickness: Plus 1/2 inch (13 mm), minus zero inch (zero mm).
 - 3. Architectural Facing Thickness: Plus 1/8 inch (3 mm), minus zero inch (zero mm).
 - 4. Backing Thickness: Plus 1/4 inch (6 mm), minus zero inch (zero mm).
 - 5. Panel Depth from Face of Skin to Back of Panel Frame or Integral Rib: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
 - 6. Angular Variation of Plane of Side Mold: Plus or minus 1/32 inch per 3 inches (0.8 mm per 75 mm) of depth, or plus or minus 1/16 inch (1.5 mm) total, whichever is greater.

CONTRACT No. 22-523
DIVISION 3 - CONCRETE

7. Variation from Square or Designated Skew (Difference in Length of Two Diagonal Measurements): Plus or minus 1/8 inch per 72 inches (3 mm per 1800 mm) or plus or minus 1/4 inch (6 mm) total, whichever is greater.
8. Local Smoothness: 1/4 inch per 10 feet (6 mm per 3 m).
9. Bowing: Not to exceed L/240 unless unit complies with erection tolerances using connection adjustments.
10. Length and Width of Block Outs and Openings within One Unit: Plus or minus 1/4 inch (6 mm).
11. Location of Window Opening within Panel: Plus or minus 1/4 inch (6 mm).
12. Maximum Permissible Warpage of One Corner out of the Plane of the Other Three: 1/16 inch per 12 inches (1.5 mm per 305 mm) of distance from nearest adjacent corner.

C. Position Tolerances: Measured from datum line locations, as indicated on Shop Drawings.

1. Panel Frame and Track: Plus or minus 1/4 inch (6 mm).
2. Flashing Reglets at Edge of Panel: Plus or minus 1/4 inch (6 mm).
3. Inserts: Plus or minus 1/2 inch (13 mm).
4. Special Handling Devices: Plus or minus 3 inches (75 mm).
5. Location of Bearing Devices: Plus or minus 1/4 inch (6 mm).
6. Blockouts: Plus or minus 3/8 inch (10 mm).

D. Panel Frame Tolerances: As follows:

1. Vertical and Horizontal Alignment: 1/4 inch per 10 feet (6 mm per 3 m).
2. Spacing of Framing Member: Plus or minus 3/8 inch (10 mm).
3. Squareness of Frame: Difference in length of diagonals of 3/8 inch (10 mm).
4. Overall Size of Frame: Plus or minus 3/8 inch (10 mm).

2.12 FINISHES

A. Exposed faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints, shall be uniform, straight, and sharp. Finish exposed-face surfaces of GFRC to match approved mockups and as follows:

1. Smooth Finish: Provide surfaces to match approved sample with uniform color and texture.
2. Textured-Surface Finish: Impart by form liners.
3. Retarded Finish: N/A
4. Sand- or Abrasive-Blast Finish: N/A
5. Acid-Etched Finish: N/A

2.13 SOURCE QUALITY CONTROL

A. Quality-Control Testing: Establish and maintain a quality-control program for manufacturing GFRC panels according to PCI MNL 130.

1. Test materials and inspect production techniques.

CONTRACT No. 22-523
DIVISION 3 - CONCRETE

2. Quality-control program shall monitor glass-fiber content, spray rate, unit weight, product physical properties, anchor pull-off and shear strength, and curing period and conditions.
3. Prepare test specimens and test according to ASTM C1228, PCI MNL 130, and PCI MNL 128 procedures.
4. Test GFRC inserts and anchors according to ASTM C1230 to validate design values.
5. Produce test boards at a rate of no fewer than one per work shift per operator for each spray machine and for each mix design.
 - a. For each test board, determine glass-fiber content according to ASTM C1229 and flexural yield and ultimate strength according to ASTM C947.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine structure and conditions for compliance with requirements for installation tolerances, bearing surfaces, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

- A. Install clips, hangers, and other accessories required for connecting GFRC panels to supporting members and backup materials.
- B. Install GFRC panels level, plumb, square, and in alignment. Provide temporary supports and bracing as required to maintain position, stability, and alignment of panels until permanent connections are completed.
 1. Maintain horizontal and vertical joint alignment and uniform joint width.
 2. Remove projecting hoisting devices.
- C. Connect GFRC panels in position by bolting or welding, or both, as indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as possible after connecting is completed.
- D. Welding: Comply with applicable AWS D1.1/D1.1M and AWS D1.3/D1.3M requirements for welding, appearance, quality of welds, and methods used in correcting welding work.
 1. Protect GFRC panels from damage by field welding or cutting operations, and provide noncombustible shields as required.
- E. At bolted connections, use lock washers or other acceptable means to prevent loosening of nuts.

3.3 ERECTION TOLERANCES

- A. Erect GFRC panels to comply with the following noncumulative tolerances:

CONTRACT No. 22-523
DIVISION 3 - CONCRETE

1. Plan Location from Building Grid Datum: Plus or minus 1/2 inch (13 mm).
2. Top Elevation from Nominal Top Elevation: As follows:
 - a. Exposed Individual Panel: Plus or minus 1/4 inch (6 mm).
 - b. Nonexposed Individual Panel: Plus or minus 1/2 inch (13 mm).
 - c. Exposed Panel Relative to Adjacent Panel: 1/4 inch (6 mm).
 - d. Nonexposed Panel Relative to Adjacent Panel: 1/2 inch (13 mm).
3. Support Elevation from Nominal Elevation: As follows:
 - a. Maximum Low: 1/2 inch (13 mm).
 - b. Maximum High: 1/4 inch (6 mm).
4. Maximum Plumb Variation over the Lesser of Height of Structure or 100 Feet (30 m): 1 inch (25 mm).
5. Plumb in Any 10 Feet (3 m) of Element Height: 1/4 inch (6 mm).
6. Maximum Offset in Alignment of Matching Edges: 1/4 inch (6 mm).
7. Face Width of Joint: As follows (governs over joint taper):
 - a. Panel Dimension 20 Feet (6 m) or Less: Plus or minus 1/4 inch (6 mm).
 - b. Panel Dimension More Than 20 Feet (6 m): Plus or minus 3/8 inch (9.5 mm).
8. Maximum Joint Taper: 3/8 inch (10 mm).
9. Maximum Joint Taper in 10 Feet (3 m): 1/4 inch (6 mm).
10. Differential Bowing, as Erected, between Adjacent Members of Same Design: 1/4 inch (6 mm).

3.4 REPAIRS

- A. Repairs are permitted provided structural adequacy of GFRC panel and appearance are not impaired, as approved by Architect.
- B. Mix patching materials and repair GFRC so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces.
- C. Prepare and repair accessible damaged galvanized coatings with galvanizing repair paint according to ASTM A780/A780M.
- D. Wire brush and clean accessible weld areas on prime-painted components and paint with same type of shop primer.
- E. Remove and replace damaged GFRC panels when repairs do not comply with requirements.

3.5 CLEANING AND PROTECTION

- A. Perform cleaning procedures, if necessary, according to GFRC manufacturer's written instructions. Clean soiled GFRC surfaces with detergent and water, using soft fiber brushes and sponges, and rinse with clean water. Prevent damage to GFRC surfaces and staining of adjacent materials.

CONTRACT No. 22-523
DIVISION 3 - CONCRETE

END OF SECTION 034900

SECTION 03 60 00 - GROUT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Portland cement grout.
 - 2. Rapid curing epoxy grout.
 - 3. Non-shrink grout.
 - 4. Dry pack grout.

- B. Related Sections:
 - 1. Section 03 30 00 – Concrete and Reinforcing Steel
 - 2. Section 05 12 00 – Structural Steel Framing
 - 3. Section 05 50 00 – Metal Fabrications and Anchorage

1.2 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 301 – Specifications for Structural Concrete.
 - 2. ACI 318 – Building Code Requirements for Structural Concrete.
 - 3. ACI 305.1-06 – Standard Specifications for Hot Weather Concreting
 - 4. ACI 305 – Hot Weather Concreting.
 - 5. ACI 306.1 – Standard Specification for Cold Weather Concreting
 - 6. ACI 306R – Cold Weather Concreting

- B. American Society of Testing and Materials:
 - 1. ASTM C33 – Standard Specification for Concrete Aggregates.
 - 2. ASTM C40 – Test Method for Organic Impurities in Fine Aggregates for Concrete.
 - 3. ASTM C109 – Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-inch or 50 mm Cube Specimens)
 - 4. ASTM C150 – Standard Specification for Portland Cement.
 - 5. ASTM C191 – Test Method for Time of Setting of Hydraulic Cement by Vicat Needle.
 - 6. ASTM C307 – Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing.
 - 7. ASTM C531 – Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
 - 8. ASTM C579 – Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts, monolithic Surfacing and Polymer Concretes.
 - 9. ASTM C827 – Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.
 - 10. ASTM C939 – Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow cone Method).
 - 11. ASTM C1107 – Packaged Dry, Hydraulic Cement Grout (Non-Shrink)

- C. U. S. Army Corps of Engineers Concrete Research Division (CRD):
 - 1. CRD C621 – Non-Shrink Grout.

1.3 SUBMITTALS

- A. For each type grout used submit the following:
 - 1. Sufficient data to demonstrate compliance with the specified requirements, including product data, material certifications and technical data sheets.
 - 2. Manufacturer’s instructions for mixing, handling, surface preparation, placement and appropriate uses.
 - 3. Material Safety Data Sheets (MSDS).
 - 4. Certified test results verifying the compressive strength, shrinkage and expansion requirements specified herein. Certifications or affidavits will not be acceptable.

1.4 QUALITY ASSURANCE

- A. Field Tests
 - 1. Compression test specimens will be taken during construction from the first placement of each type of grout and at intervals thereafter as selected by the Engineer to ensure continued compliance with these Specifications.
 - a. Compression tests and fabrication of specimens for cement grout and non-shrink grout will be performed as specified in ASTM C109 at intervals during construction as selected by the Engineer. A set of three specimens will be made for testing at seven days, 28 days and any additional time period as appropriate.
 - b. Compression tests and fabrication of specimens for epoxy grout will be performed as specified in ASTM C579, Method B, at intervals during construction as selected by the Engineer. A set of three specimens will be made for testing at seven days and any other time period as appropriate.
- B. Grout which has already been placed and which fails to meet the requirements of these Specifications, is subject to removal and replacement by the Contractor at no additional cost to the Owner.
- C. The Contractor shall provide the services of a qualified manufacturer's technical representative who shall instruct the Contractor's personnel in the mixing, proper use and application of the non-shrink grout and epoxy grout.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver grout in manufacturer's unopened containers with proper labels intact.
- B. Store grout in a dry shelter, protect from moisture.

PART 2 PRODUCTS

2.1 PORTLAND CEMENT GROUT

- A. Portland cement grout shall be composed of Portland cement, sand and water. The sand to be used shall be selected to suit the spacing for placement. Where sand is not usable, the grout shall be composed of cement and water only.
- B. The Alkali-Silica Reaction Potential of aggregates used in Portland cement grout shall be evaluated. When aggregates are determined to be potentially reactive with alkalis, the aggregate shall not be used.
- C. Portland Cement: ASTM C150, Type I and II.
- D. Water:
 - 1. Potable; containing no impurities, suspended particles, algae or dissolved natural salts in quantities capable of causing:
 - a. Corrosion of steel.
 - b. Volume change increasing shrinkage cracking.
 - c. Efflorescence.
 - d. Excess air entraining.
- E. Fine Aggregate:
 - 1. Washed natural sand conforming to the requirements of ASTM C33.
 - 2. Free from injurious amounts of organic impurities as determined by ASTM C40.
- F. Mix Design
 - 1. Gradation of sand and mix proportioning shall be in accordance with the following table for grouts using natural sands and having a minimum 28-day compressive strength of 4,000 psi. For higher strength grouts or those using manufactured sands, strength shall be established by trial mixes.
 - a. Gradation for Natural Sand

Sieve Size	Spaces less than one (1) inch	Spaces one (1) inch or more
Passing 3/8		100
Passing 4	100	95-100
Passing 8	95-100	80-100
Passing 16	70-100	50-85
Passing 30	40-75	25-60
Passing 50	10-35	10-30
Passing 100	2-15	2-10
Passing 200	--	--

b. Mix Proportioning

By Volume	Non-Air Entrained Grouts (Maximum 4 Percent Entrapped Air)		Air Entrained Grouts (Air 8 Percent to 10 Percent)	
	Spaces less than one (1) inch	Spaces one (1) inch or more	Spaces less than one (1) inch	Spaces one (1) inch or more
Cement	1	1	1	1
Sand (dry rodded)	1.85	2.10	1.6	1.7
Sand (damp & loose)	2.30	2.35	2.0	2.1
Maximum water (gals per bag)	5.5	5.5	5.1	5.1

2. Water shall be kept to a minimum, the amounts noted in the preceding table are the maximum for grout. Proportioning by volume shall be limited to small quantities mixed at the job site.
3. White Portland cement shall be mixed with the Portland cement as required to match the color of adjacent concrete
4. Do not use ferrous aggregate or staining ingredients in grout mixes.

2.2 RAPID CURING EPOXY GROUT

- A. High strength, three component epoxy grout formulated with thermosetting resins and inert fillers. Rapid-curing, high adhesion, and resistant to ordinary chemicals, acids and alkalis.
- B. The Alkali-Silica Reaction Potential of aggregates used in epoxy grout shall be evaluated. When aggregates are determined to be potentially reactive with alkalis, the aggregate shall not be used.
- C. Epoxy grout shall conform to the following properties:

Property	Test	Result
Compressive Strength	ASTM C579	12,000 psi at 7 days
Tensile Strength	ASTM C307	2,000 psi minimum
Coefficient of Expansion	ASTM C531	30x10-6 in per degree F
Shrinkage	ASTM C827	None

- D. Acceptable Products and Manufacturers:
 1. Sikadur 42 Grout-Pak - Sika Chemical Co.
 2. E³ – Euclid Chemical Co.

3. Masterflow 647 – Master Builders.
4. Or Approved Equal.

2.3 NON-SHRINK GROUT

A. General Requirements:

1. Non-shrink grout shall be non-metallic, non-shrink, non-gas forming, pre-mixed and ready-for-use requiring only the addition of water at the job site.
2. Grouts depending on oxidation to limit shrinkage shall not be used.
3. Grout shall contain no metals nor rust of corrosion promoting agents, or gypsum.
4. The addition of set control agents or water reducers shall not be permitted.
5. The grout manufacturer shall furnish test data from an independent laboratory indicating that the grout when placed at a fluid consistency shall achieve 95% bearing under a 4' x 4' base plate.
6. When high fluidity and/or increased placing time is required use high flow grout. The highflow grout manufacturer shall furnish test data from an independent laboratory indicating that the grout when placed at a fluid consistency shall achieve 95% bearing under a 18" x 36" base plate.

B. Non-shrink grout shall conform to the following properties

Property	Test	Time	Result
Setting Time	ASTM C191	Initial	45 minutes (Min.)
		Final	3 hours (Approx.)
Shrinkage			
- Below Placement Volume	ASTM C827		0%
- Drying	CRD 588-76		0%
Expansion	CRD 588-76		0.4% (Max.)
Compressive Strength (Flowable Consistency)	CRD-C621	1 day	3,000 psi
		7 days	6,000 psi
		28 days	9,000 psi (Min.)
Pull-Out Strength	#5 bar grouted 6" deep in a 7/8" dia. Hole in saturated surface dried concrete		10,000 lb

C. Acceptable Products and Manufacturers:

1. Standard Non-Shrink Grout
 - a. NS Grout – Euclid Chemical Co.
 - b. Masterflow 713 Plus – Master Builders.
 - c. Sikagrout 212 – Sika Chemical Co.
 - d. Or Approved Equal.
2. High Flow Grout
 - a. Hi-Flow Grout – Euclid Chemical co.

CONTRACT No. 22-523
DIVISION 3 – CONCRETE

- b. Masterflow 928 – Master Builders.
- c. Or Approved Equal.

2.4 DRY PACK

- A. Dry pack (to be packed or tamped in place) shall be made at no slump consistency.
- B. When mixing the batch, only enough water shall be added to the dry materials to produce a rather stiff mixture, then additions of water may be made in small increments until the desired consistency is obtained.
- C. Dry pack grout shall conform to the following properties:

Property	Test	Time	Result
Expansion	CRD 588-76		0.4% (Max.)
Compressive Strength	CRD-C621	1 day	3,000 psi
		7 days	6,000 psi
		28 days	9,000 psi (Min.)

- D. Acceptable Products and Manufacturers:
 - 1. Dry Pack Grout – Euclid Chemical Co.
 - 2. L&M Dry Pack Grout – L&M Construction Chemicals.
 - 3. Or Approved Equal.

2.5 CURING

- A. Prevent rapid loss of water from grout in accordance with manufacturer’s written instructions.

PART 3 EXECUTION

3.1 GROUT USES

- A. The different types of grout shall be used for the applications stated below unless noted otherwise in the Specifications or on the Contract Drawings. Where grout is called for in the Specifications or on the Contract Drawings which does not fall under any of the applications stated below, non-shrink grout shall be used.
 - 1. Portland cement grout shall be used for grout toppings and for patching fresh concrete.
 - 2. Non-shrink grout shall be used for grouting beneath base plates of equipment and structural metal framing.

3.2 EXAMINATION

- A. Verify areas to receive grout.

3.3 PREPARATION

- A. Prepare all contact surfaces in accordance with manufacturer's recommendations.
- B. Remove defective concrete, laitance, dirt, oil, grease and other foreign material from concrete surfaces by brushing, hammering, chipping or other similar means until sound, clean concrete surface is achieved.
- C. Rough concrete lightly, but not enough to interfere with placement of grout.
- D. Remove foreign materials from metal surfaces in contact with grout.
- E. Align, level and maintain final positioning of components to be grouted.
- F. Saturate concrete surfaces with clean water 12 to 24 hours prior to grouting. Before placing grout, remove all excess and free standing water.

3.4 INSTALLATION - FORMWORK

- A. Construct leakproof forms anchored and shored to withstand grout pressures.
- B. Install formwork with clearances to permit proper placement of grout.

3.5 MIXING

- A. General Requirements
 - 1. Measurements for grout shall be made accurately by weight or by volume using containers. All measurements shall be made in a manner satisfactory to the Engineer. Prepackaged grouts shall have ingredients measured by means recommended by the manufacturer.
 - 2. The amount of water used should be the minimum quantity to produce the grout of the desired consistency.
 - 3. Mix grout components in proximity to work area and transport mixture quickly and in manner not permitting segregation of materials
- B. Portland Cement Grout:
 - 1. Prepare grout with water to obtain consistency to permit placing and packing.
 - 2. Mix water and grout in two steps; pre-mix using approximately 2/3 of water; after partial mixing, add remaining water to bring mix to desired placement consistency.
 - 3. Mix only quantities of grout capable of being placed within 30 minutes after mixing.
 - 4. Do not add additional water after grout has been mixed.
- C. Rapid Curing Epoxy Grout
 - 1. Mix and prepare rapid curing epoxy grout in accordance with manufacturer's instructions.

- D. Non-Shrink Grout
 - 1. Mix and prepare non-shrink grout in accordance with manufacturer's instructions.

3.6 PLACING GROUT

- A. All work shall be done in strict accordance with manufacturer's recommendations, including special procedures for hot and cold weather grouting.
- B. At the request of the Engineer, the manufacturer's representative shall be called to the job site for consultation regarding detailed use of the grout.
- C. The consistency of grouts shall be that necessary to completely fill the space to be grouted for the particular application. Dry pack consistency shall be such that the grout is plastic and moldable but will not flow.
- D. Grout shall be placed quickly and continuously, shall completely fill the space to be grouted, be thoroughly compacted and free of air pockets. The grout may be poured in place, pressure grouted by gravity, or pumped.
- E. For grouting beneath base plates, grout shall be poured from one side only and shall flow across to the open side to avoid air-entrapment.
- F. The use of pneumatic pressure or dry-packed grouting requires approval of the Engineer.
- G. Do not vibrate placed grout mixture, or permit placement when area is being vibrated by nearby equipment.
- H. Thoroughly compact final installation and eliminate air pockets.
- I. Do not remove forms until after the grout has taken an initial set and will not slump. After removal, cut off excess grout and finish to a smooth surface.
- J. Do not remove leveling shims for at least 48 hours after grout has been placed.

3.7 CURING

- A. Immediately after placement, protect grout from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. After grout has attained its initial set, keep damp for minimum of 3 days.

- END OF SECTION -

SECTION 05 12 00 – STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Structural shapes
 - 2. Channels and angles
 - 3. Hollow structural sections
 - 4. Structural pipe
 - 5. Structural plates and bars
 - 6. Fasteners, connectors, and anchors
- B. Related Sections:
 - 1. Section 03 60 00 – Grout
 - 2. Section 05 50 00 – Metal Fabrications and Anchorage
- C. Structural and miscellaneous metals covered with concrete need not receive primers, intermediate, or finish coats of paint.

1.2 REFERENCES

- A. General Requirements:
 - 1. Except as modified by governing codes and by this Specification, comply with the applicable provisions and recommendations of latest editions of the following.
 - 2. Where the language in any of the documents referred to herein is in the form of a recommendation or suggestion, such recommendations or suggestions shall be deemed to be mandatory under this Contract unless otherwise directed by the Engineer.
 - 3. The duties and responsibilities of the Owner, Engineer and Contractor shall not be altered by any standard referenced.
 - 4. Conflicts: Conform to requirements of cited standard unless specified otherwise. In case of apparent conflict between standards, or between standards and the specifications herein, the more stringent shall apply unless otherwise directed by the Engineer.
- B. American Institute of Steel Construction:
 - 1. Design, Fabrication, and Erection: “Specification for Structural Steel Buildings, Allowable Stress Design and Plastic Design”, June 1, 1989, by the American Institute of Steel Construction (AISC Specification).
 - 2. AISC 303 – Code of Standard Practice for Steel Buildings and Bridges.
 - 3. AISC 341 – Seismic Provisions for Structural Steel Buildings.
 - 4. AISC 360 – Specification for Structural Steel Buildings.

- C. ASTM International:
 - 1. ASTM A6 – Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
 - 2. ASTM A36/A36M – Standard Specification for Carbon Structural Steel.
 - 3. ASTM A572, Grade 50 Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
 - 4. ASTM A992, Grade 50 Standard specification for Structural Steel Shapes.
 - 5. ASTM A53/A53M – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-coated, Welded and Seamless.
 - 6. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
 - 7. ASTM A325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 - 8. ASTM A501 – Standard Specification for hot-formed Welded and Seamless Carbon Steel Structural Tubing.
 - 9. ASTM A992/A992M – Standard Specification for Structural Steel Shapes.
 - 10. ASTM F1554 – Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
 - 11. ASTM D2200, Pictorial Surface Preparation Standards for Painting Steel Surfaces.

- D. American Welding Society:
 - 1. AWS A2.4 – Standard Symbols for Welding, Brazing, and Nondestructive Examination.
 - 2. AWS D1.1 – Structural Welding Code - Steel.

- E. Research Council on Structural Connections:
 - 1. RCSC – Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts.

- F. SSPC: The Society for Protective Coatings:
 - 1. SSPC – Steel Structures Painting Manual.

- G. New York State Department of Transportation, Office of Structures:
 - 1. Steel Construction Manual.

1.3 REQUIREMENTS FOR CONNECTIONS

- A. Structural steel connections not detailed on the Contract Drawings shall be designed by a Professional Engineer engaged by the Contractor registered in the State of New York.

- B. General:
 - 1. Except where Type 1 (rigid-frame) or Type 3 (semi-rigid framing) connections are indicated, the design has been prepared on the basis of Type 2 (simple or unrestrained) connections, complying with the provisions of Section A2.2 of the AISC Specification.

2. Do not use connection details which depend upon sharing the stress between any combination of high-strength bolts in bearing-type connections and welds.
 3. Size connections for the loads indicated on the Drawings. If the loads are not indicated, use a connection whose capacity is half the total uniform load capacity shown in the “Allowable uniform loads in kips for beams laterally supported” tables in the AISC Manual for the given shape, span, and steel specification of the beam in question, unless otherwise indicated.
 4. All bolted connections shall have a minimum of two bolts.
- C. Shop Connections: Unless otherwise indicated, all shop connections shall be welded, or high strength bolted. Field connections required to be welded or fully-tensioned high-strength bolted shall meet the same requirements when fabricated in the shop.
- D. Field Connections:
1. The following field connections shall be welded, or fully-tensioned high-strength bolted:
 - a. Column splices
 - b. Column bracing
 - c. Connections for supports of machinery
 - d. All connections of eave struts, eave purlins, first interior purlins, ridge beams, and ridge purlins to rigid frames and trusses
 2. All other bolted field connections need only be tightened to the snug tight condition.
 3. When steel members of any cross section are to be spliced by welding in the field, a detailed welding procedure shall be submitted to the Engineer for approval. The procedure shall be detailed on shop drawings, submitted and approved prior to the fabrication of structural steel. The detailed field welding procedure shall include the method of supporting members during welding. All field welded splices shall be subject to non-destructive testing, Radiographic Testing (RT), or Ultrasonic Testing (UT), as determined by the Engineer. Field splice locations, when specifically shown on contract documents, shall not be relocated nor shall splices be added without written approval of the Director.
- E. Standard Beam Connections:
1. Unless otherwise shown on the Drawings or required in the Specifications, all beam connections shall be framed in accordance with Part 4 of the AISC Manual, with sizes and lengths of angles and welds and with fastener spacings as shown therein.
 2. Standard beam connections shown on the Drawings shall be fabricated as detailed. Substitutions will not be approved.
- F. Special Beam Connections:
1. Where special conditions make it impracticable to provide connections complying with Paragraphs A thru D, and no details for such connections are shown on the Drawings, special connections shall be used. Such special connections shall, in general, comply with the provisions of the AISC Manual.

2. Typical details of proposed special connections shall be shown on the job standards.
3. Special connections shown on the Drawings shall be fabricated as detailed. Substitutions will not be approved.

1.4 SUBMITTALS

A. Product Data:

1. Producers or manufacturer's specifications and installation instructions for all products supplied including but not limited to the following. Include laboratory test reports and other data to show compliance with specified requirements.
 - a. Structural steel shapes, channels, angles, hollow structural sections, structural pipe, structural plates, structural bars and related fabrications (each type).
 - b. Bolts (each type), including nuts and washers
 - c. Surface Preparation and Shop Paint
 - d. Reports of ladle analysis for all steel
 - e. Reports of tensile properties and bend tests
 - f. Certificates of conformance
 - g. Reports of mechanical properties of headed stud type shear connectors
 - h. Reports of mechanical tests.
 - i. Description of each type of welding stud and arc shield
 - j. Field Paint

B. Shop Drawings:

1. Submit shop drawings and bills of materials including complete details and schedules for fabrication and shop assembly of members, and details, schedules, procedures and diagrams showing the sequence of erection. Information to be provided includes:
 - a. Details of the location, type, size, etc., of bolts and welds.
 - b. Details of cuts, connections, camber, holes, and other pertinent data.
 - c. Indicate welds by standard AWS A2.4 welding symbols. Show size, length, and type of each weld.
 - d. Setting drawing templates and directions for installation of anchor bolts and other anchorages.
 - e. Identify details to sheet and detail number on the drawings.
 - f. Structural calculations.
2. Elements of fabricated items inadvertently omitted on contract drawings shall be detailed by the fabricator and indicated on the shop drawings.
3. Drawings which accompany the Contract Documents are designated Contract Drawings. Contract Drawings shall not serve as shop drawings. The Contractor shall draw and originate his own erection plans, anchor bolt plans, details and any other drawings necessary for his work. The Engineer's drawings shall not be reproduced, copied, traced or reused for erection or detail shop drawings.
4. Match Marks: Provide a diagram showing the match marks for connecting structural parts assembled in the shop for the purpose of erecting structures true and plumb, and/or for connections.

5. Design of details and connections, including moment connections, and calculations shall be signed and sealed by a Professional Engineer registered in the State of New York.
 6. Architectural Clearances: No part of the steel work, such as seat stiffeners, brackets, bracing, etc. shall be permitted to interfere with architectural clearances.
- C. Erection Procedures:
1. Accompanying the Shop Drawings, submit descriptive data to illustrate the structural steel erection procedure, including the sequence of erection and temporary staying and bracing.
 2. Erection drawings shall show the identifying marks of all members.
- D. Welding Procedure: Submit written description as required to illustrate each welding procedure to be performed in the specified work.
- E. Field Welding Equipment: Submit descriptive data for field welding equipment, including type, voltage and amperage.
- F. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.
- G. Mill Test Reports: Submit indicating structural strength, destructive and non-destructive test analysis.
- H. Alignment Certificate: Submit certification and survey data attesting that alignment requirements have been complied with following erection.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with the following:
1. Structural Steel: AISC 303.
 2. High Strength Bolted Connections: RCSC Specification for Structural Joints Using ASTM A325 or A490 Bolts.

1.6 QUALIFICATIONS

- A. Fabricator: Company specializing in performing Work of this section with minimum 5 years documented experience.
- B. Erector: Company specializing in performing Work of this section with minimum 5 years experience.
- C. Shop Painter: Company specializing in performing Work of this section with minimum 5 years experience.
- D. Welders and Welding Procedures: AWS D1.1 qualified within previous 12 months.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. General Requirements:
 - 1. Deliver materials to site at such intervals to insure uninterrupted progress of work.
 - 2. Deliver anchor rods and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time not to delay that work.
- B. Delivery of Materials to be Installed Under Other Sections:
 - 1. Anchors bolts and other anchorage devices which are embedded in cast-in-place concrete or masonry construction shall be delivered to the project site in time to be installed before the start of cast-in-place concrete operations or masonry work.
 - 2. Provide setting drawings, templates, and directions for the installation of the anchor bolts and other devices.
- C. Storage of Materials:
 - 1. Store materials to permit easy access for inspection and identification.
 - 2. Structural steel members stored at the project site shall be above ground on platforms, skids or other supports.
 - 3. Steel shall be protected from corrosion.
 - 4. Other materials shall be stored in a weather tight and dry place, until ready for use in the work.
 - 5. Packaged materials shall be stored in their original unbroken package or container.
- D. Materials which fail to comply with specified requirements, either at the shop or project site, shall be promptly removed from the site and replaced with acceptable material, without additional cost to the Owner, and without causing delay in work.

PART 2 PRODUCTS

2.1 STRUCTURAL STEEL

- A. Structural steel members, except for angles, shall comply with ASTM A572 or ASTM A992, Grade 50, high strength steel, new and unused, except where other type of steel is indicated.
- B. Steel angles shall comply with ASTM A36/A36M, new and unused, except where other type of steel is indicated.
- C. Round Hollow Structural Sections: ASTM A500/A500M, Grade B.
- D. Square and Rectangular Hollow Structural Sections: ASTM A500/A500M, Grade B.
- E. Structural Pipe: ASTM A53/A53M, Type E or S, Grade B.
 - 1. Finish: Black except where indicated to be galvanized.

2.2 FASTENERS, CONNECTORS, AND ANCHORS

- A. Anchor Bolts: ASTM A307; Grade A or ASTM A36.
 - 1. Finish: Unfinished.
- B. High Strength Bolts and Nuts: ASTM A325; Type 1.
 - 1. Finish: Unfinished.
- C. Nuts: ASTM A563 heavy hex type.
 - 1. Finish: Unfinished.
- D. Washers: ASTM F436; Type 1, circular.
 - 1. Finish: Unfinished.
- E. Anchor Rods: ASTM F1554; Grade 36.

2.3 WELDING MATERIALS

- A. Welding Materials: AWS D1.1; type required for materials being welded.

2.4 ACCESSORIES

- A. Shop Primer: Compatible with Finish Paint.
- B. Touch-Up Primer: Match shop primer.

2.5 FABRICATION

- A. Shop Fabrication and Assembly:
 - 1. Fabricate and assemble structural assemblies in shop to greatest extent possible.
 - 2. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings.
 - 3. Properly mark and match-mark materials for field assembly and for identification as to structure and site for which intended.
 - 4. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
 - 5. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of member exposed in final structure free of markings, burrs, and other defect.
 - 6. Develop required camber for members.
- B. Connections:
 - 1. All connections that are not specifically detailed on the drawings shall be properly designed for the standard end loads of the members to be connected, as tabulated for uniform load in the AISC Steel Construction Manual.
 - 2. Fabricate connections for bolt, nut, and washer connectors.
 - 3. All shop connections shall be welded.

4. All field connections shall be bolted using A325 hexagonal bolts and nuts except where welding may be required or as otherwise noted on the drawings.
 - a. All thread area shall be excluded from shear planes.
 - b. Minimum size bolt shall be 3/4-inch diameter.
 - c. High strength bolted connections shall conform to the AISC Specifications.
- C. Welded Construction:
 1. Welding shall conform to AWS "Code for Welding in Building Construction" and to the AISC specifications.
 2. Assemble and weld built-up sections by methods which will produce true alignment of axes without warp.
 3. Continuously seal joined members by continuous welds. Grind exposed welds smooth.
 4. Complete visual inspection shall be provided by the Contractor prior to welding, during welding and on completed weldments.
 5. Necessary equipment, tools and gauges to be used for quality control of fabrication, construction and erection shall be made available for use by the Engineer during inspection.
- D. Bolts:
 1. Anchor bolts shall be provided with double nuts and washers for leveling.
 2. All unfinished bolts shall be provided with lock washers.
- E. Bearing Plates:
 1. Provide bearing plates for all open web joists, beams or girders bearing on concrete piers or walls.
 2. Bearing plates shall be loose or attached as applicable.
- F. Holes for Other Work:
 1. Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final shop drawings.
 2. Provide threaded nuts welded to framing and other specialty items as indicated to receive other work.
 3. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.6 FINISH

- A. New and Existing Ferrous Metals, Structural Steel (With or Without Sprayed Fireproofing), Miscellaneous Ferrous Metals, Exterior Surfaces of Valves, Exterior Surfaces of Ferrous Piping, and Exterior Surfaces of All Ferrous Metal (Both Exposed and to be Later Covered With Insulation); Non-submerged, Interior:
 1. Shop Primer and Field Primer:
 - a. Generic Components:

- 1) Minimum 67 percent volume solids, build, two-component, cycloaliphatic amine-catalyzed epoxy or polyamido-amine epoxy coating; 250 grams per liter VOC, maximum.
 - b. Products and Manufacturers: Provide one of the following:
 - 1) Series V69 Hi-Build Epoxoline (TCI); Carboguard 954 HB (TCC): One coat, 4.0 to 6.0 dry mils.
 2. Finish: High-Gloss:
 - a. Generic Components:
 - 1) Minimum 80 percent volume solids, high-build, chemical-resistant, high-gloss, modified, polyamine- or polyamidoamine-catalyzed epoxy finish; 25 grams per liter VOC, maximum.
 - b. Products and Manufacturers: Provide one of the following:
 - 1) Series V69 Hi-Build Epoxoline (TCI); Carboguard 890 LT (TCC):
 - a) Horizontal Surfaces: One coat, 6.0 to 12.0 dry mils.
 - b) Vertical Surfaces: One coat, 4.0 to 8.0 dry mils.
- B. New and Existing Ferrous Metals, Non-Ferrous Metals, and Galvanized Metals; Non-Submerged, Exterior:
 1. Ferrous Metal Shop Primer:
 - a. Generic Components:
 - 1) Minimum 67 percent solids, polyamidoamine epoxy; 296 grams per liter, VOC, maximum.
 - b. Products and Manufacturers: Provide one of the following:
 - 1) Series V69 Hi-Build Epoxoline (TCI); Carboguard 954 (TCC): One coat, 4.0 to 6.0 dry mils.
 2. Intermediate (Ferrous Metals Only):
 - a. Generic Components:
 - 1) For Low-temperature Curing Conditions: Minimum 75 percent solids, cycloaliphatic amine or polyamine epoxy; 296 grams per liter VOC, maximum.
 - 2) For Warm-temperature Curing Conditions: Minimum 75 percent volume solids, cycloaliphatic amine or polyamine epoxy; 296 grams per liter VOC, maximum.
 - b. Products and Manufacturers: Provide one of the following:
 - 1) For Low-temperature Curing Conditions: Series 136, Epoxoline HS (TCI); Carbguard 890 or 890 LT (TCC): One coat, 10.0 dry mils.
 - 2) For Warm-temperature Curing Conditions: Series 166 Epoxoline HS (TCI); Carbguard 890 or 890 LT (TCC): One coat, 6.0 dry mils.
 3. Shop coat shall be omitted in areas to be field welded, on contact surfaces of high strength bolted connections, on all surfaces to be permanently embedded in concrete, fireproofed, or galvanized.
 4. Do not omit shop paint at piece marks on otherwise painted pieces.

- C. Galvanizing:
 - 1. In addition to members indicated on the Drawings and/or specified; all exterior exposed steel, all loose lintels in exterior walls; and all nuts, washers and the top 12 inches of exterior anchor bolts shall be hot-dip galvanized, after fabrication, in accordance with the requirements of the applicable specifications and other requirements listed below
 - 2. ASTM A123/A123M; hot dip galvanize after fabrication.
 - 3. Galvanizing for Fasteners, Connectors, and Anchors:
 - a. Hot-Dipped Galvanizing: ASTM A153/A153M.
 - b. Mechanical Galvanizing: ASTM B695; Class 50 minimum.

2.7 SOURCE QUALITY CONTROL AND TESTS

- A. General - The fabricator shall perform the following inspection and testing:
 - 1. Inspect high-strength bolted connections, visually inspect welded connections, perform required tests and inspections and prepare test reports.
 - 2. Submit test reports to the Engineer.
 - 3. Review mill test reports, verify identity of steel with respect to mill test reports and, if found to comply with the specification requirements, so certify to the Engineer.
 - 4. If steel is not accompanied by test reports, or test reports fail to verify compliance, perform additional tests in compliance with procedures specified in the appropriate ASTM Specifications and prepare test reports.
 - 5. Conduct and interpret the tests and state in each report whether the test specimens comply with specification requirements.
 - 6. Inspect structural steel at the plant before shipment, however, the engineer reserves the right, at any time before final acceptance, to reject material not complying with specified requirements.
 - 7. Verify dry mil thickness of shop prime coat.
 - 8. Perform any additional tests as may be necessary to reconfirm any noncompliance of the original work, and as may be necessary to show compliance of corrected work.
- B. Shop Bolted Connections:
 - 1. Inspect in accordance with AISC 303.
 - 2. Visually inspect all bolted connections.
- C. Shop Welding:
 - 1. Inspect and test during fabrication of structural steel assemblies as follows:
 - a. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
 - b. Visually inspect all welds.

- D. Access:
 - 1. Provide access for the Engineer to the place where structural steel work is being fabricated or produced so that the required inspection and testing can be witnessed.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Erector must examine areas and conditions under which structural steel work is to be installed and notify the Engineer in writing of conditions detrimental to proper and timely completion of work.
 - 1. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the Engineer.
 - 2. Execution of the work under this section constitutes acceptance of the base or adjoining work and other conditions as satisfactory in every respect.
- B. Verify bearing surfaces are at correct elevation.
- C. Verify anchors rods are set in correct locations and arrangements with correct exposure for steel attachment.

3.2 PREPARATION

- A. Furnish templates for installation of anchor rods and embedments in concrete and masonry work.
- B. Ferrous Metals:
 - 1. Ferrous Metals Except Ductile and Cast Iron:
 - a. Comply with paint manufacturer's recommendations for type and size of abrasive to provide a surface profile that meets manufacturer's painting system requirements for type, function, and location of surface. Verify that paint manufacturer-recommended profiles have been achieved on prepared surfaces. Report profiles to Engineer using Test Method C of ASTM D4417.
 - b. Clean non-submerged ferrous surfaces including structural steel and miscellaneous metal to be shop-primed, of all oil, grease, dirt, mill scale, and other contamination by commercial blast cleaning complying with SSPC SP 6 at time of paint system application, using SSPC VIS 1 as a standard of comparison.
 - c. Clean non-submerged, ferrous surfaces that have not been shop-coated of all oil, grease, dirt, loose mill scale, and other contamination by commercial blasting complying with SSPC SP 6 at the time of painting system application, using SSPC VIS 1 as a standard of comparison.
 - d. Touch-up shop-applied prime coats that have damaged or have bare areas with primer recommended by paint manufacturer after commercial

blasting complying with SSPC SP 6 at the time of painting system application, using SSPC VIS 1 as a standard of comparison, to provide a surface profile of not less than one mil.

- e. Power tool-clean per SSPC SP 3 to remove welding splatter and slag.
- f. Remove all rust and contamination on existing ferrous metals to sound surfaces by power tool-cleaning complying with SSPC SP 11 to provide a surface profile of not less than one mil.

3.3 ERECTION

- A. All structural steel shall be erected in accordance with the AISC "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings" and the "Code of Standard Practice for Steel Buildings and Bridges".
- B. Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in alignment until completion of erection and installation of permanent bracing.
- C. Erecting equipment shall be adequate for the work and safety and no existing work shall be damaged or defaced.
- D. Any members damaged during the erection of steel shall be repaired in the shop or replaced at the expense of the Contractor as directed by the Engineer.
- E. Plumbing and Leveling:
 - 1. Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming a part of a complete frame or structure before permanently fastening.
 - 2. All work shall be set level and plumb with individual members of structure within specified AISC tolerances. All work shall be within a tolerance of 1:500 for design slope, level or plumb except elevator shafts which shall conform to manufacturer's requirements.
 - 3. Level and/or plumb shall be checked to the satisfaction of the Engineer using leveling instrument and plumb-bob, or other acceptable means before permanent connections are made.
 - 4. Base and bearing plates which require grouting with a non-shrinking material shall be supported at the designated level by means of adjusting nuts on the anchor bolts.
 - 5. All discrepancies in plumbs and levels shall be reported to the Engineer and corrected.
- F. Field Holes, Reaming and Drifting:
 - 1. No burning of holes for any purpose will be allowed.
 - 2. Field holes shall be drilled.
 - 3. Light drifting will be permitted to draw the parts together but drift pinning to enlarge holes or to match unfair holes will not be permitted.
 - 4. Any enlargement of holes shall be done by reaming with twist drills.

5. After steel work is erected, the Contractor shall see that no one is allowed to burn holes in the steel members, except as approved in writing by the Engineer.
- G. Temporary Bracing:
1. Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guide lines to achieve proper alignment of structures as erection proceeds.
 2. During erections, steel cables with turnbuckles shall be installed in sufficient number to prevent distortion or damage to the framework due to wind or erection forces.
 3. These cables shall be used to plumb and line columns before final bolting and shall be left in place until sufficient masonry bracing has been placed to insure the lateral stability of the structure.
- H. Anchor Bolts and Column Base Plates:
1. Anchor bolts and other required anchorage items shall be verified for proper size and accurate location prior to erection of structural steel work.
 2. Column baseplates shall be supported and aligned on steel wedges or shims. After supported members have been plumbed and positioned and the anchor nuts tightened, the entire bearing area under each base plate shall be packed solidly with grout as specified under Section 03 60 00 – Grout.
 3. Wedges and shims shall be cut-off flush with edges of plate and shall be left in place.
 4. Moist cure grout.
 5. Remove forms after grout is set. Trim grout edges to form smooth surface, splayed 45 degrees.
 6. Tighten anchor bolts after grout has cured for a minimum of 3 days.
- I. Field Connections:
1. Installation, tension control and wrenches used for high strength bolting shall conform to the SISC "Specifications for Structural Joints using ASTM A325 Bolts" as approved by the Research Council on Riveted and Bolted Structural Joints.
 2. Tightening of nuts shall be accomplished with properly calibrated wrenches or by the "Turn-of-Nuts" method, at the Contractor's option.
 3. Calibrated wrenches shall be checked for accuracy at least once daily.
 4. Bolts completely tightened shall be marked with an identifying symbol.
 5. Common bolts shall be drawn up tight and the threads set after the work has been plumbed and leveled.
 6. Field welding shall be performed in accordance with AWS D1.1 - Structural Welding Code – Steel.
- J. Exposed erection bolt holes shall be plug welded and ground smooth.

- K. Steel members exposed to the exterior view shall have all integrally raised letters ground off smooth.
- L. Do not field cut or alter structural members without approval of Architect/Engineer.
- M. After erection, touch up welds and abrasions to match shop finishes.

3.4 FIELD PAINTING

- A. Field painting shall include painting of bolts, field welds, abrasions and places where the shop coat has been broken or omitted.
- B. Paint shall be the same as used for the shop coat and shall be supplied by the steel fabricator.
- C. Before the touch-up paint is applied, the area to be coated shall be sandblasted to a commercial finish in accordance with SSPC-SP6.
- D. At welds, all flux and scale shall be removed.

3.5 FIELD QUALITY CONTROL

- A. Bolted Connections: Inspect in accordance with AISC 303.
 - 1. Visually inspect all bolted connections.
- B. Welding: Inspect welds in accordance with AWS D1.1.
 - 1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
 - 2. Visually inspect all welds.
- C. Correct defective bolted connections and welds.

– END OF SECTION –

SECTION 05 31 00 – STEEL DECK

PART 1 GENERAL

1.1 SUMMARY

- A. The work specified in this Section consists of furnishing, fabricating and installation of cellular, non-cellular, composite floor decking, non-composite form decking and appurtenant items. The work shall be completed in place as shown on the Contract Drawings and called for in the Detailed Specifications.
- B. The work shall include all incidental and miscellaneous items not specified under another Section but required for the work of this Section, whether or not specifically referred to herein.
- C. Related Sections:
 - 1. Section 03 30 00 – Concrete and Reinforcing Steel
 - 2. Section 05 12 00 – Structural Steel

1.2 REFERENCES

- A. American Society for Testing and Materials, (ASTM):
 - 1. ASTM A385 – Practice for Providing High Quality Zinc Coatings (Hot Dip)
 - 2. ASTM A653 – Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process
 - 3. ASTM A780 – Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
 - 4. ASTM A924 – General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
 - 5. ASTM B6 – Zinc
- B. American Galvanizers Association, (AGA).
- C. Specification for the Design of Cold-Formed Steel Structural Members, (AISI).
- D. Cold-Formed Steel Design Manual, (AISI).
- E. Design Manual for Composite Decks, Form Decks and Roof Decks, and Cellular Metal Floor Deck with Electrical Distribution No. 29, (SDI).
- F. American Welding Society:
 - 1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination
 - 2. AWS D1.1 - Structural Welding Code – Steel
 - 3. AWS D1.3 - Structural Welding Code – Sheet Steel

1.3 SUBMITTALS

A. Shop Drawings:

1. Detailed Shop Drawings which indicate for each type of steel decking required, the material, steel thickness, designation and finish, a dimensional cross-sectional profile, and computed structural properties to verify compliance with project requirements shall be submitted. Details of fabrication and erection, including various connections, layouts of deck units placement directions, bearing on structural supports, anchorage details, attachment of accessories, each condition requiring closure panels, supplementary framing, cut opening, special jointing and other accessories as required to complete the work shall be shown on the Shop Drawings. Details and layout shall show location of supporting members, quantity and marking of decking units, size and location of holes and openings to be cut and the location, type and sequence of welded connections.
2. Review of Shop Drawings will be for general considerations only. Compliance with specified requirements for materials, fabrication and erection of steel decking shall be the exclusive responsibility of the Contractor.

B. Certifications:

1. General:
 - a. Test requirements for materials as stated herein or incorporated in reference documents may be waived, provided that certified copies of test reports from approved laboratories performed on previously manufactured material are submitted.
2. Manufacturers Certifications:
 - a. Manufacturer's certifications as required to show compliance with these specifications shall be submitted. Copies of mill test reports, including names and locations of mills and shops, covering the chemical and physical properties of the steel sheet to show compliance with these specifications shall be submitted. Test reports shall be accompanied by notarized certificates of compliance from the manufacturer certifying that the previously tested material is of the same type, quality and manufacture as that proposed for this project.
3. Certification for Welders:
 - a. Certification that each welder has been qualified within the previous 12 month period shall be provided in accordance with AWS D1.1.

C. Manufacturer's Data:

1. Manufacturer's specifications and installation instructions for each type of required decking and accessory shall be submitted. These include sheet steel, steel deck units, galvanized mill finish, painting finish, finished repair paint, welding electrodes, welding washers, fasteners, closure strips, cover plates, accessories and similar items.

1.4 QUALITY ASSURANCE

- #### A.
- Except as otherwise specified, the SDI "Design Manual" cited herein shall govern the work.

- B. Qualification of Manufacturer:
 - 1. Steel deck units and accessories shall be provided where indicated on the Contract Drawings and shall be the products of a manufacturer who is regularly engaged in the manufacture of steel decking.

- C. Qualification of Welders:
 - 1. Each welder shall be qualified in accordance with AWS D1.1. A welder shall be retested and recertified when the work of the welder creates a reasonable doubt as to his or her proficiency. Such tests when required shall be conducted at no additional expense to the City. Recertification of the welder shall be submitted only after the welder has taken and passed the required retest.

- D. Testing and Inspection:
 - 1. Material and fabrication procedures are subject to inspection and tests in the mill, shop and field. These tests shall be conducted by the Testing Laboratory in accordance with the requirements of General Conditions. Such inspection and tests shall not relieve the Contractor of responsibility of providing materials and fabrication procedures in compliance with specified requirements.

- E. Factory Inspection:
 - 1. Except as specified otherwise in this paragraph, factory tests and inspections of materials will not be required provided that certified copies of factory test reports are submitted to the Engineer for approval. These shall include manufacturer's certificates of compliance with all requirements of these specifications. When the test reports are on materials previously manufactured they shall be accompanied by notarized statements from the manufacturer certifying that the materials being furnished are identical with previously manufactured materials on which the factory test reports are based.

- F. Shop Drawing Reviews:
 - 1. Such reviews shall be obtained before custom fabrication is started and before delivery of materials to the project site.

- G. Coordination:
 - 1. Work of this Section shall be coordinated with the work of other trades so that construction is not delayed.

- H. Safety:
 - 1. Steel deck erection procedures and health and safety of the work force shall be the responsibility of the Contractor. The requirements of authorities having jurisdiction shall be complied with.

- I. Responsibility for Errors:
 - 1. Errors of detailing and fabrication and for the correct fit of the steel deck units shall be the responsibility of the Contractor.

- J. Remedial Action:
 - 1. Materials, fabrications and workmanship found defective shall be promptly removed and replaced and new acceptable work shall be provided in accordance with Contract requirements at no additional expense to the City.
- K. Design of floor deck layout, spas, fastenings, joints, and framed openings shall be under the direct supervision of a Professional Engineer experienced in structural design of decking and licensed in the State of Maryland.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery:
 - 1. Materials shall be delivered to the site in an undamaged condition and at such intervals as will avoid delay in the work.
- B. Storage:
 - 1. Material shall be stored and protected in a clean, properly drained location. Material shall be kept off the ground under a weather-tight covering permitting good air circulation. Decking shall be stored on dry wood sleepers, pallets, platforms or other appropriate supports which have slope for positive drainage. Decking shall be protected from distortion, excessive stresses, corrosion and other damage.
 - a. Caution: Materials shall not be stored on the structure in a manner that might cause distortion or damage to the supporting structure. The maximum uniform distributed storage load shall not exceed 20 pounds per square foot.
- C. Handling:
 - 1. Material shall be handled safely in a manner that will prevent distortion or other damage. Care shall be exercised at all times to avoid damage through careless handling during unloading, storing and erecting.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Galvanized Steel Deck: ASTM A653, Grade 33, Coating designation G90, type and thickness as shown on Contract Drawings but not less than 20 gage.
 - 1. Galvanizing: ASTM A924, Commercial quality.
 - 2. Galvanizing Repair Paint: ASTM A780, high zinc-dust/zinc oxide content paint for repair of damaged galvanized surfaces and field touch-up of welds.
 - 3. Formed Steel Closure Strips or Plates: ASTM A653, galvanized, minimum 12 gage, except as otherwise indicated.
 - 4. Formed Steel Cover Plates: ASTM A653, galvanized. The thickness shall be minimum 20 gage but not less than the steel deck thickness.
 - 5. Sheet Steel Accessories: ASTM A653, commercial quality, galvanized (thickness indicated or as suitable for use intended).

- B. Welding Washers: Standard type compatible with decking furnished.

2.2 DESIGN

A. General:

- 1. The steel deck shall be designed in accordance with AISI Specification for the Design of Cold-Formed Steel Structural Members, except as specified otherwise herein. Deck units shall have ribbed sections providing a satisfactory surface for the reception of design loads. Wherever practicable, units shall have sufficient length to span three or more supports. The depth and gage of deck shall be as specified on the Contract Drawings.

B. Allowable Deflection:

- 1. Deck shall be designed to support the weight of the roofing system and construction live load of 20 psf uniform load or 150 pounds concentrated load on a 1 foot wide section of deck. Calculated deflection shall be limited to 1/240 of the span.

C. Attachments:

- 1. Deck units shall be installed and anchored to supporting members to provide lateral stability and resist design horizontal load indicated on the Contract Drawings. Fastening requirements to resist horizontal loads shall be in accordance with SDI “Diaphragm Design Manual.”

- D. Section Properties shall be determined in accordance with AISI “Specification for the Design of Cold-Formed Steel Structural Members.” The properties of steel deck section shall be computed on the basis of the effective design width as limited by the provision of the AISI Specifications. The section properties not less than shown shall be provided for the specified steel deck section, including section modulus and moment of inertia per foot of width.

2.3 FABRICATION

A. General:

- 1. Deck units shall be manufactured in lengths to span three or more supports, where possible, with flush, telescoped or nested 2-inch end laps and nested side laps, unless otherwise indicated on the Contract Drawings. End laps shall occur over supports. Deck configurations shall comply with SDI requirements and as specified herein.

B. Composite Steel Floor Deck and Non-composite Steel Form Deck:

- 1. Galvanized Steel Deck Units shall be manufactured from galvanized steel conforming to ASTM A653, Grade 33 except as otherwise indicated on the Contract Drawings. Configuration of deck units shall conform to standard SDI wide-rib fluted profile, of the depth, steel thickness or gage and section properties as indicated on the Contract Drawings.
 - a. Non-composite steel form deck units shall be formed to provide a fluted profile. The depth, type and steel thickness or gage shall be as indicated

- on the Contract Drawings. Side laps shall be fabricated with lock seam joints.
2. Manufacturers:
 - a. United Steel Deck, Inc.
 - b. Vulcraft Corporation.
 - c. Or Approved Equal.
 - C. Formed Steel Closure Strips:
 1. Steel closure strips of not less than 12 gage sheet steel of the same quality and material as the deck units shall be provided and shall form to the configuration required to provide tight-fitting closures at open ends and sides of decking.
 - D. Painting of Deck:
 1. On the steel deck surface to be painted in the field, the galvanized surface shall be primed in accordance with the requirements of Specification 09 96 00.

PART 3 EXECUTION

3.1 EXAMINATION

- A. General:
 1. The areas and conditions under which work of this Section is to be performed shall be examined. Conditions detrimental to the proper and timely completion of the work shall be corrected. Work shall not proceed until satisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General:
 1. Deck units and accessories shall be installed in accordance with manufacturer's recommendations, approved Shop Drawings and as specified herein.
 - a. Deck bundles shall be coordinated with structural steel erector in locating decking bundles to prevent overloading of structural members.
 - b. Deck Storage: Deck units shall not be used for storage or working platform until permanently secured.
- B. Placing of Deck Units:
 1. Deck units shall be placed on supporting framework with edges up and flutes at right angles to supports. Decking shall be adjusted to final position with ends bearing lying at least 3 inches on supporting members. Also the decking ends shall be accurately aligned before being permanently fastened. Lap end shall not be less than 2 inches for welded construction of all roof decks. Side laps shall be one-half corrugation. The side lap interlock shall not be stretched or contracted. Deck units shall be placed flat and square, and shall be secured to adjacent framing without warp or excessive deflection and with close alignment between cells at ends of abutting deck units.

- C. Cutting and Framing:
1. Steel deck units and accessories shall be cut and fitted around other work projecting through or adjacent to the floor decking, as shown on the Contract Drawings. Neat, square and trim cuts shall be provided.
- D. Welding:
1. Steel deck units shall be permanently fastened to steel supporting members by not less than 5/8-inch-diameter fusion (puddle) welds or elongated welds of equal strength. Welding washer shall be used where recommended by the deck manufacturer. AWS requirements and procedures for manual shielded metal-arc welding appearance, quality and methods used in correcting welding work shall be complied with. The ambient temperature when welding is performed shall be 35 degree Fahrenheit or higher. Welds shall be free of cracks, craters and other defects. Units with burned holes or any other damage shall be replaced promptly with satisfactory units at no additional cost to the City. Metal accessories shall be securely welded in place.
- E. Attachments:
1. Steel deck units shall be fastened to the supporting members to resist horizontal load as indicated on the Contract Drawings in accordance with SDI “Diaphragm Design Manual.” In no case shall the fastening requirements be less than the following:
 - a. End Laps and Edge Supports: End laps and all edge supports shall be fastened at 6 inches on center. Joints shall be taped at all end laps to prevent concrete leakage.
 - b. Intermediate Supports: Each sheet shall be anchored by welding at each intermediate support not less than 12 inches on center and at closer spacing where required for lateral force resistance, unless otherwise shown on the Contract Drawings.
 - c. Side Laps: Side laps between adjacent deck units shall be locked by welding at intervals not exceeding 24 inches on center or half of the span between supports, whichever is less, unless otherwise shown on the Contract Drawings.
- F. Steel Closure Strips:
1. Minimum 12 gage sheet steel closure strips shall be provided at all open uncovered ends, at edges of floor decking, at voids between decking, walls, columns, floor penetrations and other construction, and shall be welded into upturned position to thickness of slab, to contain wet concrete unless otherwise detailed. The closures shall be sufficient to remain stationary without distortion.
- G. Steel Cover Plates:
1. Steel joint covers shall be provided at abutting ends of deck units, except where taped joints are required or permitted.
- H. Reinforcement at Openings:
1. Additional steel reinforcement and closure pieces required for strength, continuity of decking, and support of other work shall be provided, unless otherwise shown on the Contract Drawings or specified.

2. Decking around openings less than 6 inches in any dimension shall be provided by means of a steel sheet of the same profile as the deck placed over the opening and fusion welded to the top surface of the deck. Steel sheet of the same quality as the deck units, not less than 18 gage and at least 14 inches wider and longer than the opening shall be provided. Welds at each corner shall be provided and spaced not more than 6 inches on centers along each side.
 3. Openings larger than 6 inches in steel deck, where framing around the opening is not shown on the Contract Drawings, shall be reinforced by steel angles on each side of the opening. The design of the framing angles shall be based on the design live load of that floor area and in no case shall the angles be less than 3-1/2 x 3-1/2 x 3/8 inches. The angles parallel to the deck span shall be connected to structural steel framing and to the angles on the other two sides of the opening by welding. The angles shall also be anchored to the deck by welding as required for supports.
- I. Deck surfaces which are to be covered with concrete shall be completely cleaned of all loose materials and any material or coating which could interfere with concrete bond development.

3.3 GALVANIZING REPAIR

- A. Decking and accessories shall be cleaned and touched-up where field cut, welded, burned or otherwise damaged. Spot repairs to galvanized finish shall be made in accordance with ASTM A780 where required at no cost to the City.

3.4 PROTECTION

- A. During installation, the steel decking shall not be used as a storage platform nor as a working platform until the deck units have been permanently fastened in position.
- B. The surface of installed steel decking shall not be overloaded during the entire construction period.
- C. Mechanical equipment or other loads, either temporarily or permanently shall not be hung from steel decking unless otherwise detailed or permitted.

3.5 FINISH PAINTING

- A. Exposed to view surfaces of steel deck and composite floor deck units shall be field painted.

3.6 FIELD QUALITY CONTROL

- A. Welding: Inspect welds in accordance with AWS D1.1.

– END OF SECTION –

SECTION 05 40 00 - COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.1 DESCRIPTION

- A. Furnish all equipment, labor, materials, and services required to provide all prefabricated cold formed steel framing elements, accessories and related items. Include anchorage, bracing, bridging and related items as required to complete the work.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 05 12 00 – Structural Steel

1.3 REFERENCES

- A. Except as shown or specified otherwise, the Work of this Section shall meet the requirements of the following:
 - 1. General Standard: “Specification for the Design of Cold-Formed Steel Structural Members” by the American Iron and Steel Institute (AISI Specification).
 - 2. Welding: “Structural Welding Code - Sheet Steel, AWS D1.3” by the American Welding Society (AWS Code).
- B. Organizations:
 - 1. AISI: American Iron and Steel Institute, 1140 Connecticut Ave., NW, Suite 705, Washington, D.C. 20036, (202) 452-7100, www.steel.org.
 - 2. AWS: American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33126, (800) 443-9353, www.aws.org.
 - 3. ASTM: ASTM International, 100 Barr Harbor Dr., PO Box C700, West Conshohocken, PA, 19428-2959, (610) 832-9500, www.astm.org.
 - 4. SSPC: The Society for Protective Coatings, 40 24th Street, 6th Floor, Pittsburgh PA 15222-4656, (877) 281-7772, www.sspc.org.

1.4 REQUIREMENTS FOR CONNECTIONS

- A. Cold formed metal framing connections not detailed on the Contract Drawings shall be designed by a Professional Engineer engaged by the Contractor registered in the State of New York.
- B. Connections shall be designed in accordance with AISI and the New York State Building Code.

1.5 SUBMITTALS

- A. Shop Drawings: Erection and fabrication drawings for all load carrying metal framing and accessories.
 - 1. Include the following in an early submission:
 - a. Erection drawings indicating sizes and locations of all metal framing members.
 - b. Anchor bolt plan showing anchor bolts, if any, to be placed in cast-in-place concrete Work.
 - c. Show plans and elevations at not less than 1/4 inch to 1'-0" scale, and details at not less than 1-1/2 inch to 1'-0" scale.
 - 2. Do not submit fabrication drawings, other than for anchor bolts, until after approval of the erection drawings.
 - 3. When shop drawings are marked "Make Corrections Noted", promptly resubmit copies of corrected shop drawings for formal approval and record.
- B. Product Data: Manufacturer's printed specifications and installation instructions for each type of metal framing and accessory, including data required to show compliance with the Drawings and Specifications.
- C. Quality Control Submittals:
 - 1. Certificates: Affidavit required under Quality Assurance Article.
 - 2. Design calculations for connections signed and sealed by a Professional Engineer registered in the State of New York.

1.6 QUALITY ASSURANCE

- A. Certification: Affidavit certifying that sheet steel complies with specified quality, grade, and zinc-coating.
- B. Fire Rated Construction: Wherever a fire resistance classification is indicated for metal framing components, provide framing and accessories which have been tested and classified or listed for the construction and rating shown.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver metal framing to the Site in manufacturer's unopened containers or bundles, identified with brand, type, and gage.
- B. Protect metal framing from damage and rusting. Store off the ground in dry, ventilated space.
- C. Store and handle metal framing in a manner that will not cause distortion.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Framing (including Studs, Tracks, Joists, Perimeter Channel, and Rafters):
 - 1. Members of 12, 14, and 16 Gage Steel: Galvanized, structural quality sheet steel; ASTM A653, Grade D (minimum yield 50 KSI).
 - 2. Members of 18 and 20 Gage Steel: Galvanized, structural quality sheet steel; ASTM A653, Grade A (minimum yield 33 KSI).

- B. Accessories and Fasteners:
 - 1. Bracing, Bridging, Strapping, Reinforcement, Stiffeners, Plates, Gussets, Clip Angles, and Hangers: Unless otherwise indicated, metal framing manufacturer's standard products formed from ASTM A653 galvanized, structural quality sheet steel. Thickness and grade shall be determined by application requirements, with a minimum thickness of 20 gage and a minimum yield of 33 KSI.
 - 2. Power-Actuated Fasteners: Low velocity, powder activated, threaded studs complying with ASTM E 1190 and zinc coated in accordance with ASTM B633, Type III, Classification 5.
 - a. Minimum Stud Size: 1/4-20 thread, 0.145 inch diameter shank, with 1/4-20 nut and 5/8 inch outside diameter washer.
 - b. Stud Material: ASTM A510 1060 or 1065 steel.
 - c. Minimum Core Hardness: 51-56 Rockwell C.
 - d. Minimum Tensile Strength: 285,000 psi.
 - e. Minimum Shear Strength: 182,000 psi.
 - 3. Self-Drilling Fasteners: Cadmium plated, No. 12-14 x 3/4 inch, hex washer head, self-drilling, self-tapping fastener with pilot point.

- C. Galvanizing: Hot-dip process complying with ASTM A653, Coating Designation G 60.

- D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

2.2 FABRICATION

- A. Fabricate metal framing in accordance with "No Exceptions Taken" or "Make Corrections Noted" fabrication drawings only.
 - 1. When fabrication drawings are "Make Corrections Noted", progress fabrication in strict accordance with the marks and notes thereon.

- B. Pre-fabricated panels shall be not more than 1/8 inch out of square within the length of the panel, and shall be in compliance with the tolerances specified in Part 3.

- C. Repairing Galvanizing: Clean shop welded and abraded surfaces, and repair them with a 2 mil (dry) minimum thick coating of galvanizing repair paint. Comply with paint manufacturer's application instructions.

- D. For metal framing indicated to receive insulation, install full width insulation in voids which will be inaccessible after fabrication.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine surfaces to receive metal framing for defects that will adversely affect the execution and quality of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 SURFACE PREPARATION

- A. Clean surfaces that support the Work of this Section.

3.3 INSTALLATION

- A. Install metal framing and accessories in accordance with approved shop drawings, and with the metal framing manufacturer's printed installation instructions.
- B. Provide temporary bracing to ensure stability of the structure during construction.
- C. Repairing Galvanizing: Clean field welded and abraded surfaces, and repair them with a 2 mil (dry) minimum thick coating of galvanizing repair paint. Comply with paint manufacturer's application instructions.
- D. Tolerances:
 - 1. Vertical Alignment (Plumbness) of Studs: Within 1/960th (1/8 inch in 10 feet) of the height.
 - 2. Horizontal Alignment (Levelness) of Walls: Within 1/960th (1/8 inch in 10 feet) of their respective lengths.
 - 3. Spacing of Studs: Not more than + 1/8 inch from the designed spacing, providing that the cumulative error does not exceed the requirements of the finishing materials.
- E. For metal framing indicated to receive insulation, install full width insulation in voids which will be inaccessible after erection.
- F. Installation of Runner Tracks:
 - 1. Install continuous bottom and top tracks of size and gage shown. Align track accurately and, unless otherwise shown, attach to supporting structure with power-driven fasteners at 16 inches oc. Install fasteners at corners and ends of tracks.
 - 2. At track butt joints, securely attach abutting pieces of track to a common structural element, or splice them with a welded butt joint.

- G. Installation of Studs:
1. Install studs of size and gage shown. Space studs 16 inches maximum O.C, unless otherwise shown.
 2. Install additional studs at wall corners and intersections, adjacent to wall openings, at wall ends, and at both sides of control joints (if any).
 - a. For gypsum board applications, keep studs not less than 2 inches nor more than 6 inches from inside corners.
 3. Install full length studs, without splices, between runner tracks.
 4. Install axially loaded studs with full bearing against the webs of the bottom and top runner tracks.
 5. Plumb and align studs and, unless otherwise shown, provide positive attachment to runner tracks using self-drilling fasteners or welds on both flanges of studs.
 6. Install lintels at wall openings wider than the stud spacing as shown or scheduled, or if not shown or scheduled, as recommended by the metal framing manufacturer for the opening spans and loads involved.
 7. Unless otherwise shown, install rough framing at openings using full length studs at the ends of lintels and jack studs from the bottom track to the underside of the lintels. Install horizontal header tracks and, where required, horizontal sill tracks. Cut horizontal tracks to length, with split flanges and bent webs for flange overlap and attachment to jack studs with self-drilling fasteners. Install cut to length intermediate studs between jack studs at head and sill sections at the same spacing as full length studs.
 8. At door openings, install rough framing as specified in 7. above. Coordinate jack studs with the types of door frames to be furnished.
 - a. Where solid core wood doors, double doors, or doors weighing more than 50 pounds are shown or scheduled, install 2 full length studs at the ends of lintels instead of one.
 9. Install horizontal bridging in equally spaced rows, not exceeding 3'-4" oc. For each row, install solid bridging between studs at corners, ends of walls, openings, and not exceeding 5'-4" O.C, plus continuous 2 inch by 16 gage strapping on both sides of the wall. Attach solid bridging to each flange of the studs with one self-drilling fastener, or make an equivalent welded connection. Attach the continuous strapping to flanges of all solid bridging with four self-drilling fasteners and to flanges of all studs with one self-drilling fastener, or make equivalent welded connections.
 10. Install diagonal bracing as shown.

– END OF SECTION –

CONTRACT No. 22-523
DIVISION 5 – METALS

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SECTION 05 50 00 - METAL FABRICATIONS AND ANCHORAGE

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. All metal fabrications and miscellaneous metal items which are not included on the drawings, in the specifications or in other areas of the Contract Documents.
 2. Shop fabricated ferrous and non-ferrous metal items which, in general, includes bollards, lintels, shelf angles, bearing plates, overhead door frames, ladders, access hatches, checkered floor plate, wall brackets, specialty pipe supports, crane support columns and beams, trash racks, etc.
 3. Anchorage
- B. Related Sections:
1. Section 03 60 00 – Grout
 2. Section 05 12 00 – Structural Steel Framing

1.2 REFERENCES

- A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards, and specifications, except where more stringent requirements are specified herein:
1. ANSI A14.3 – Ladders, Fixed, Safety Requirement
 2. ASTM A992 – Grade 50 Structural Steel
 3. ASTM A572 – Grade 50 Structural Steel
 4. ASTM A53 – Pipe, steel, black and hot-dipped, zinc-coated welded and seamless
 5. ASTM A123 – Zinc (Hot-Galvanized) Coatings on Products Fabricated From Rolled, Pressed and Forged Steel Shapes, Plates, Bars, and Strip
 6. ASTM A153 – Zinc (Hot-Galvanized) Coatings on Iron and Steel Hardware
 7. ASTM A276 – Stainless and Heat-Resistant Steel Bars and Shapes
 8. ASTM A283 – Low and Intermediate Tensile Strength Carbon Steel Plates
 9. ASTM A307 – Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
 10. ASTM A325 – Structural Bolts, Heat Treated, 120/105 ksi Tensile Strength
 11. ASTM A489 – Carbon Steel Eyebolts
 12. ASTM A500 – Cold-Formed welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
 13. ASTM A501 – Structural Tubing
 14. ASTM A536 – Ductile Iron Castings
 15. ASTM B209 – Aluminum-Alloy Sheet and Plate
 16. ASTM B221 – Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
 17. ASTM B308 – Aluminum-Alloy 6061-T6 Standard Structural Shapes
 18. ASTM B632 – Aluminum Tread Plate
 19. American Welding Society (AWS)
 - i. AWS A2.0 – Standard Welding Symbols.
 - ii. AWS D1.1 – Structural Welding Code - Steel.
 - iii. AWS D1.2 – Structural Welding Code - Aluminum.

20. Steel Structures Painting Council (SSPC)
21. "Construction Manual Series, Section 1, Specifications for Aluminum Structures, December, 1986", by the Aluminum Association, Incorporated (AAI Specification).

1.3 SUBMITTALS

- A. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of holes and fasteners, and all accessories. Include detailed fabrication and erection drawings, elevations, bill of materials, finishes, and details where applicable.
 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- B. Shop drawings for connections not detailed on the Contract Drawings shall be signed and sealed by a licensed Professional Engineer in the State of New York who performed the design.
- C. Manufacturer's product data, samples for selection of finish, color, texture, and other properties.
- D. Anchorage:
 1. Sizing Calculations.
 2. Load Ratings.
 3. Material Schedule.
 4. Performance Specifications.
 5. Installation procedures.

1.4 QUALITY ASSURANCE

- A. Finish joints in accordance with NOMMA Guideline 1.
- B. Design of all load supporting systems shall be performed under the direct supervision of a Professional Engineer experienced in design of the Work and licensed in State of New York.
- C. Weld procedures and welder personnel shall be AWS certified. Certifications shall be submitted prior to performing the related work.
- D. All anchors shall be a product from a manufacturer regularly engaged in the manufacture and supply of similar items for at least 5 years.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Structural Steel Sections: ASTM A992 or A572; Grade 50.
- B. Steel Channel, Angle and Plate: ASTM A36.

- C. Steel Plates to be Bent or Cold-Formed: ASTM A283, Grade C.
- D. Steel Bars and Bar-Size Shapes: ASTM A675, Grade 70; or ASTM A36.
- E. Merchant Quality Steel Bars: ASTM A575, grade as selected by fabricator.
- F. Cold-Finished Steel Bars: ASTM A108, grade as selected by fabricator.
- G. Hot-Rolled Carbon Steel Sheet and Strip: ASTM A569, pickled and oiled.
- H. Cold-Rolled Carbon Steel Sheet: ASTM A366, oiled.
- I. Galvanized Steel Sheet: ASTM A 526, with G90 hot-dip process zinc coating complying with ASTM A525.
- J. Hollow Structural Sections: ASTM A500/A501, Grade B.
- K. Cold-Drawn Steel Tubing: ASTM A512, buttwelded, cold-finished carbon steel tubing, sink drawn and stress relieved.
- L. Cast Iron Castings: ASTM A48, gray iron castings, Class 30.
- M. Malleable Iron Castings: ASTM A47, grade as selected by fabricator.
- N. Steel Castings: ASTM A27, grade and class as required by use of item.
- O. Steel Pipe: ASTM A53, Grade B, Schedule 40.
- P. Rolled Steel Floor Plate, Raised Pattern: ASTM A786; raised herringbone pattern unless otherwise indicated.
- Q. Aluminum Pipe: Aluminum Alloy 6061-T6.
- R. Aluminum Sections: ASTM B308, Alloy 6061-T6. Use Aluminum Association Shapes.
- S. Aluminum Checkered Floor Plate: ASTM B632, Alloy 6061-T6.
- T. Stainless Steel Angles and Plates: ASTM A276. Type 316.
- U. Stainless Steel: Type 302/304; ASTM A666 for plate, sheet and strip; ASTM A276 for bars and shapes; ASTM A269 for tubing.
- V. Fasteners: Except where shown or specified, select fasteners of type, size, style, grade, and class required for secure installation of metal fabrications. For exterior use and where built into exterior walls, fasteners shall be galvanized.
 - 1. Standard Bolts and Nuts: ASTM A307, Grade A, regular hexagon head.
 - 2. Machine Bolts: ASME B18.5 or ASME B18.9, Type, Class, and Form as required.
 - 3. Machine Screws: ASME B18.6.3.

CONTRACT No. 22-523
DIVISION 5 – METALS

4. Lag Screws: ASME B18.2.1.
 5. Wood Screws: Flat head, ASME B18.6.1.
 6. Plain Washers: Round, ASME B18.22.1.
 7. Lock Washers: Helical, spring type, ASME B18.21.1.
 8. Toggle Bolts: Spring Wing Type; Wing AISI 1010, Trunion Nut AISI1010 or Zamac Alloy, Bolt Carbon Steel ANSI B18.6.3.
- W. Bolts, Nuts and Washers:
1. Stainless Steel: ASTM A276 Type 316 Stainless Steel, With Raised Letter Indicating Manufacturer.
 2. Steel Bolts: ASTM A325 galvanized to ASTM A153.
 3. Steel Anchor Bolts: ASTM A36 or ASTM A307 galvanized to ASTM A153.
 4. Steel Eyebolts: ASTM A489
- X. Sheet Steel: ASTM A653/A653M, Grade 33 Structural Quality galvanized to ASTM A153
- B. Galvanized Items: ASTM A36; or ASTM A675, Grade 70.
- C. High-Strength Bolts: ASTM A325, galvanized.
- D. Common Bolts: ASTM A307, galvanized.
- E. Stainless Steel Fasteners:
1. Bolts: 316 alloy, ASTM F593.
 2. Nuts: 316 alloy, ASTM F594.
 3. Plain Washers: 316 alloy, FS FF-W-92, round, general assembly grade, Class B.
 4. Lock Washers: 316 alloy, FS FF-W-84, helical spring type, Class C, Style 2.
- F. Weld Filler Metal: ER5356 filler metal complying with AWS Specification A5.10.
- H. Shielding Gas: Argon.
- I. Cold Galvanizing Compound: Single component compound giving 93 percent pure zinc in the dried film, and meeting the requirements of DOD-P-21035A (NAVY).
- J. Shop Paint for Galvanized Steel: FS TT-P-641, Type II.
- K. Shop Paint (General): Primer selected from the following:
1. TNEMEC Series 15 (color as selected by the Director's Representative).
 2. Rust-Oleum 5781 (Gray) or 5769 (Red).
 3. Valspar 13-W-11.
- L. Surface Etching Solution for Shop Paint (General):
1. As recommended by the manufacturer of the paint selected.
- M. Bituminous Mastic: Cold applied asphalt mastic; SSPC - Paint 12.

2.2 GENERAL REQUIREMENTS FOR ANCHORAGE

- A. Anchorage specified herein is for anchorage of hangers, brackets, equipment, piping, electrical, HVAC, plumbing, and miscellaneous metals.
- B. Provide anchorage suitable for the design loadings times a minimum safety factor of 4.
- C. Existing concrete shall be assumed to have a compressive strength of 5000 psi.
- D. Install all anchorage in strict accordance with manufacturer's installation instructions.
- E. Anchors, washers, and nuts to be installed in wet, corrosive, or exterior locations shall be Type 316 stainless steel.
- F. Anchors, washers, and nuts to be installed in interior, enclosed, dry, temperature controlled, humidity-controlled environments shall be carbon steel hot dipped galvanized, in accordance with ASTM A153.
- G. Anchors, washers, and nuts shall not be used to resist vibratory loads in tension zones of concrete members.
- H. Anchors not shown or indicated on the drawings shall be adhesive anchors, unless otherwise specified herein.
- I. Testing of anchorage shall be as specified herein.

2.3 ANCHOR BOLTS

- A. Anchor bolts shall be used for structural anchoring and anchoring items to new concrete floors and equipment pads.
- B. All anchor bolts shall be solidly cast-in-place anchors.
- C. Provide equipment anchorage utilizing anchor bolts per equipment manufacturer's recommendations.

2.4 UNDERCUT ANCHORS

- A. Undercut anchors shall be used for overhead support into existing concrete, and all installations in cracked concrete.
- B. Undercut anchors shall be of an undercut style with brazed tungsten carbides on the embedded end that perform the self undercutting process.
- C. Undercut portion of anchor shall have a minimum projected bearing area equal to or greater than 2.5 times the nominal bolt area.
- D. The bolt shall conform to ISO 898 class 8.8 strength requirements.

- E. Product: HDA as manufactured by Hilti, or approved equal.

2.5 ADHESIVE ANCHORS

- A. Adhesive anchors shall not be used to support overhead piping larger than 4 inch diameter, or in cracked concrete.
- B. Adhesive anchors shall be used to anchor items to new and existing walls.
- C. All adhesive anchors shall be made of Type 316 stainless steel.
- D. Injectable adhesive shall be used for installation of all reinforcing steel dowels or threaded anchor rods and inserts into new or existing concrete.
- E. Adhesive shall be furnished in containers which keep the two components separate.
- F. Injection adhesive shall be formulated to include resin and hardener to provide optimal curing speed as well as high strength and stiffness.
- G. Injection adhesive shall be HIT-HY 150 or HIT-ICE, as manufactured by Hilti, or approved equal.
- H. Anchor rods shall be furnished with chamfered ends so that either end will accept a nut and washer.
- I. Anchor rods shall be in accordance with the following:
 - 1. ISO 898 Class5.8.
 - 2. ASTM A193, Grade B7 (High strength carbon steel).
 - 3. AISI 316 stainless steel, ASTM F 593, Condition CW.
- J. Use only manufacturer recommended injection tools and mixing nozzles.

2.6 EXPANSION ANCHORS

- A. Expansion anchors shall not be used to support overhead piping larger than 2 inch diameter, or in cracked concrete. Expansion anchors shall only be used overhead when anchoring to interior new concrete.
- B. Expansion anchors shall not be used to anchor items to new or existing walls, unless otherwise approved by the Engineer.
- C. Expansion anchors shall be in accordance with Federal specification A-A 1923A, Type 4.
- D. The anchor shall bear a length identification mark embossed into the impact section or dog point, of the anchor identifying the anchor.
- E. Product: Kwik Bolt 3, as manufactured by Hilti, or approved equal.

2.7 ACCESSORIES

- A. Welding Materials: AWS D1.1 and AWS D1.2: type required for materials being welded.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- C. Backpaint aluminum surfaces in contact with concrete or masonry with bituminous paint. Cold-applied asphalt emulsion complying with ASTM D 1187.
- D. Fasten aluminum with Type 316 stainless steel bolts.
- E. Bollards: 6 Inch ASTM A53, Schedule 40 Steel Pipe, Concrete Filled. Cover with Safety Yellow PVC sleeve and cap.
- F. Galvanized Steel Shelf Angles: For support of masonry, prime paint before installation and finish paint exposed surfaces per paint specification.
- G. Shop Primer: Conform to Paint Specification.
- H. Touch-Up Primer: Match shop primer.

2.8 FABRICATION

- A. General:
 - 1. All dimensions shall be field verified prior to fabrication.
 - 2. Fit and shop assemble items in largest practical sections, for delivery to site.
 - 3. Continuously seal joined members by continuous welds.
 - 4. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
 - 5. Exposed Mechanical Fastenings: Flush countersunk screws or bolts, consistent with design of component.
 - 6. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication.
- B. Miscellaneous Framing and Supports:
 - 1. Fabricate metal framing and supports, which are not a part of the structural steel framework, to support related items required by the Work.
 - 2. Fabricate units to the sizes, shapes, and profiles indicated or, if not indicated, of required dimensions to receive adjacent Work to be retained by the framing. Except as otherwise indicated, fabricate from structural steel shapes, plates, and bars, of all welded construction, with mitered corners, necessary brackets and splice plates, and a minimum number of joints for field connection. Punch, drill, and tap units to receive hardware and similar items to be anchored to the Work.
 - 3. When required to be built into masonry or cast-in-place concrete, equip units with integrally welded anchor straps. Unless otherwise indicated, anchors shall be minimum 1-1/4 x 1/4 x 8 inch steel straps, spaced 2 feet oc.

4. Galvanize exterior steel framing and supports.
- C. Miscellaneous Steel Trim:
1. Fabricate trim of shapes, sizes, and profiles shown. Fabricate units from steel shapes, plates, and bars, with continuously welded joints and smooth exposed edges, unless otherwise indicated. Use concealed field splices wherever possible. Furnish cutouts, fittings, and anchorages as required for assembly and installation.
 2. Galvanize exterior steel trim.
- D. Fixed Ladders:
1. Fabricate ladders to span between elevations at locations indicated. Comply with the requirements of ANSI A 14.3 unless otherwise shown or specified.
 2. Side Rails: Continuous, structural steel, flat solid bars with eased edges.
 3. Rungs: Structural steel, round solid bars, spaced 12 inches oc.
 4. Non-slip Surface: The top of each rung shall have a non-slip surface, achieved either by coating the rung with aluminum oxide grit set in epoxy resin adhesive or by use of manufactured rung filled with aluminum oxide grout.
 5. Fit rungs into punched holes in centerline of side rails, plug weld and grind welds smooth on outer face of rails.
 5. Supports: Locate supports for each side rail near top rung, at bottom of ladder, and at intermediate points spaced not more than 5'-0" oc. Use welded or bolted steel brackets or straps for wall anchors, designed for adequate support and anchorage to hold the ladder 6 inches clear of the wall surface and other obstructing construction.
 6. Except for ladders terminating at a hatch, extend side rails 3'-6" minimum above top rung and return rails to wall or structure; if construction does not extend above the top rung, goose-neck the extended rails back to the structure. Flare out side rails for through ladder extensions. For side-step ladders, continue the rungs also in the extension.
 7. Galvanize exterior ladders and supports.
 8. Safety Chain: ASTM A666; Type 316 stainless steel, straight link individually welded, 3/8 inch trade size.
 9. Eye Bolts: Drop forged stainless steel, shoulder pattern, threaded, 1/4 inch diameter.
 10. Snap Eye Bolts: Chrome plated, 5/8 inch swivel loop, 3/8 inch snap opening.
- E. Loose Bearing Plates:
1. Steel plates fabricated flat, free from warp or twist, and of required thickness and bearing area. Drill plates as required for anchor bolts and for grouting access. Furnish bearing plates where shown and where required for steel items bearing on masonry or concrete construction.
- F. Loose Lintels:
1. Structural steel shape lintels, fabricated for openings and recesses in masonry walls and partitions as indicated. Loose lintels bearing on masonry or concrete shall have a minimum end bearing length of 6 inches at each end, unless otherwise shown. Galvanize lintels to be installed in exterior walls.

- G. Shelf Angles:
 - 1. Galvanized structural steel shelf angles of sizes shown, fabricated for attachment to concrete framing. Angles shall have slotted holes, to receive 3/4 inch bolts, spaced not more than 6 inches from ends and not more than 24 inches oc., unless otherwise shown. Furnish wedge-type concrete inserts and fasteners for attachment of shelf angles to cast-in-place concrete.

2.9 FINISHES

- A. Prepare surfaces in accordance with the Paint Specification. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- B. Shop prime items in accordance with the Paint Specification and the reviewed paint shop drawings.
- C. Galvanizing: ASTM A123/A123M; hot dip galvanize after fabrication.
- D. Galvanizing for Fasteners, Connectors, and Anchors:
 - 1. Hot-Dipped Galvanizing: ASTM A153/A153M.
 - 2. Mechanical Galvanizing: ASTM B695; Class 50 minimum.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify field conditions are acceptable and are ready to receive Work.

3.2 PREPARATION

- A. Make provisions for erection stresses. Install temporary bracing to maintain alignment, until permanent bracing and attachments are installed.
- B. Supply items required to be cast into concrete or embedded in masonry with setting templates, to appropriate sections.

3.3 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads and provide temporary bracing to maintain indicated alignment until completion of erection and installation of permanent attachments.
- C. Field weld components indicated on Drawings and/or reviewed shop drawings. Perform field welding in accordance with AWS D1.1 and AWS D1.2.
- D. Obtain approval prior to site cutting.

- E. After erection, touch up welds, abrasions, and damaged finishes with prime paint or galvanizing repair paint to match shop finishes.

3.4 INSTALLATION OF ANCHORAGE

- A. Install all anchorage in strict accordance with Manufacturer's installation procedures.
- B. Finish paint anchors in accordance with Division 9 specifications.

3.5 ANCHORAGE TESTING

- A. Field test random selection of minimum 10% of installed anchorage of each type for floor and wall anchorage, and 150% of installed anchorage of each type for ceiling anchorage. Testing shall be performed at 100% of the allowable pullout loadings for the anchor. Testing shall be performed by an independent testing agency.
- B. The Engineer shall determine if the results of the testing reveals unsatisfactory results. If the results are unsatisfactory, the Contractor shall provide a full-scale pullout testing program.
- C. Pullout Testing Program: Contractor shall perform full scale pullout testing program if the results of anchorage testing are unsatisfactory to the Engineer. The program shall serve to ascertain the cause of the unsatisfactory strength test results and verify the suitability of the anchoring system. The pullout test –to rated capacity- shall be performed on a selection of minimum 50% of installed anchorage of each type. Pullout testing shall be performed by an independent testing agency. Testing shall conform to the requirements of ASTM E488.

3.6 FIELD QUALITY CONTROL

- A. Welding: Inspect welds in accordance with AWS D1.1 and AWS D1.2.

- END OF SECTION -

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Contractor shall provide all labor, material, tools, equipment, and incidentals as shown, specified, and required to furnish and install all rough carpentry Work.
 2. The Work also includes:
 - a. Providing openings in rough carpentry to accommodate the Work under this and other Sections and building into rough carpentry items such as sleeves, anchorages, inserts and other items to be embedded in or penetrating rough carpentry for which placement is not specifically provided under other Sections.
 - b. Providing openings in rough carpentry to accommodate the Work under other trades and assisting other trades in building into rough carpentry items such as, sleeves, anchorages, inserts, and items required for which provision is not specifically included.
 3. Extent of rough carpentry is shown or indicated.
 4. Types of materials required include:
 - a. Miscellaneous blocking, furring strips, and other miscellaneous wood framing.
 - b. Lumber for temporary protection.
 - c. Lumber for temporary support.
 - d. Pressure treatment of lumber specified in this Section.
 - e. Timber floor and roof decking.
 - f. Miscellaneous accessories.
- B. Coordination:
1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before rough carpentry Work.
 2. Notify other trades in advance of installing rough carpentry to provide other contractors with sufficient time for installing their work that must be installed with or before rough carpentry Work.
- C. Related Sections:
1. Section 05 50 00 – Metal Fabrications and Anchorage.
 2. Section 06 10 53 – Wood Nailers and Blocking
 3. Section 06 13 23 – Heavy Timber Construction
 4. Section 06 18 00 – Timber Construction
 5. Section 06 21 00 – Glued Laminated Construction

1.2 REFERENCES

- A. American Lumber Standard Committee (ALSC), Incorporated.
1. ALSC PS 20, American Softwood Lumber Standard.

- B. American Society of Mechanical Engineers (ASME).
 - 1. ASME B18.2.1, Square and Hex Bolts and Screws, Inch Series.
 - 2. ASME B18.6.1, Wood Screws, Inch Series.

- C. American Society of Testing Material (ASTM) Publications:
 - 1. ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM D2898, Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing
 - 3. ASTM D5516, Test Method for Evaluating the Flexural Properties of Fire-Retardant Treated Softwood Plywood Exposed to Elevated Temperatures.
 - 4. ASTM D5664, Test Method for Evaluating the Effects of Fire-Retardant Treatments and Elevated Temperatures on Strength Properties of Fire-Retardant Treated Lumber.
 - 5. ASTM D6305, Practice for Calculating Bending Strength Design Adjustment Factors for Fire-Retardant-Treated Plywood Roof Sheathing.
 - 6. ASTM D6841, Practice for Calculating Design Value Treatment Adjustment Factors for Fire-Retardant-Treated Lumber.
 - 7. ASTM F1667, Specification for Driven Fasteners: Nails, Spikes, and Staples.

- D. The American Wood Protection Association (AWPA).
 - 1. AWPA M4, Care of Preservative Treated Wood Products.
 - 2. AWPA P5, Waterborne Preservatives.
 - 3. AWPA P17, Fire Retardant Formulations.
 - 4. AWPA T1, Use Category System: Processing and Treatment Standard.
 - 5. AWPA U1, Use Category System: User Specification for Treated Wood.
 - 6. The Engineered Wood Association (APA).
 - 7. APA E445S, Performance Standards and Policies for Structural-Use Panels (APA PRP-108).

- E. National Institute of Standards and Technology
 - 1. NIST PS-1, Construction and Industrial Plywood.

- F. National Lumber Grade Authority (NLGA)
 - 1. Standard Grading Rules for Canadian Lumber.

- G. Northeastern Lumber Manufacturers Association (NELMA).
 - 1. Standard Grading Rules for Northeastern Lumber.

1.3 SUBMITTALS

- A. Action Submittals; Submit the following:
 - 1. Shop Drawings:
 - a. List of species and grade of lumber proposed for each use.
 - b. Fastener schedule with location, size, material and type of each fastener to be used in the Work.

- B. Informational Submittals: Submit the following:
 - 1. Certificates:
 - a. Lumber treater's certification of compliance, in accordance with Paragraph 1.3.B.1 of this Section.
 - b. Certificates of grade in accordance with Paragraph 1.3.B.2 of this Section.
 - 2. Tests and Evaluation Reports:
 - a. For fire retardant treated structural panels, test data and design adjustment values in accordance with ASTM D5516 and ASTM D6305.
 - b. For fire retardant treated lumber, test data and design adjustment in accordance with ASTM D5664 and ASTM D6841.
 - 3. Manufacturer's Instructions:
 - a. Chemical treatment manufacturer's instructions for proper use of each type of treated material.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with requirements of authorities having jurisdiction and the building code for size, spacing and attachment of wood members, unless more stringent requirements are shown or specified in the Contract Documents.
- B. Certifications:
 - 1. Pressure Treatment: For each type of pressure treatment specified, submit certification by wood treating plant stating chemicals and process used, and certifying conformance with applicable standards referenced in the Contract Documents.
 - a. For water borne preservatives, include statement that moisture content of treated materials was reduced to maximum of 19 percent prior to shipment to the Site.
 - 2. Certificates of Grade: Where appearance of wood is important and grade marks will deface the Work, in lieu of grade markings on wood, submit certificates attesting that materials comply with grade requirements specified.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Have products delivered to Site in manufacturer's original, unopened, labeled containers. Keep Engineer informed of delivery of all products to be incorporated in the Work.
- B. Clearly mark partial deliveries of component parts of equipment to identify the equipment, to permit easy accumulation of parts and to facilitate assembly.
- C. Immediately on delivery, inspect shipment to ensure:
 - 1. Product complies with requirements of Contract Documents and reviewed submittals.
 - 2. Quantities are correct.
 - 3. Containers and packages are intact, labels are legible.
 - 4. Products are properly protected and undamaged.

- D. Promptly remove damaged products from the Site and expedite delivery of new undamaged products, and remedy incomplete or lost products to provide that specified, so as not to delay progress of the Work.

1.6 JOB CONDITIONS

- A. Conform to applicable OSHA and the New York State Building Codes.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Lumber, General:
 - 1. Factory-mark each piece of lumber with type, grade, mill and grading agency. Surfaces that will be exposed to view shall not have grade marks or other types of identifying marks.
 - 2. Nominal sizes are shown or indicated, unless otherwise shown or indicated in the Contract Documents. Provide actual sizes as required by ALSC PS 20 for moisture content specified for each use.
 - a. Provide dressed lumber, surfaced four sides (S4S), unless otherwise shown or specified.
 - b. Provide seasoned lumber with 19 percent maximum moisture content at time of dressing.
 - 3. Provide the following grade and species:
 - a. No. 2 or better for material up to and including four-inch wide up to and including 12-inch wide.
 - b. Eastern White Pine, NELMA.
 - c. Spruce-Pine-Fir, NLGA.
 - d. Hem-Fir (North), NLGA.
 - 4. Lumber for Protection and Temporary Support: Size and grades to conform to Laws and Regulations, including OSHA.
- B. Plywood: Provide the following:
 - 1. NIST PS-1 rated sheathing, exterior exposure, Grade C-C, with minimum thickness shown on the Drawings, and span rating not less than 24/0.
 - a. Mark each sheet to identify plywood by species group or span rating, exposure durability classification, grade, and compliance with NIST PS-1. Surfaces that will be exposed to view shall not bear grade marks or other identifying marks.
- C. Floor and Roof Decking: Provide the following:
 - 1. For Exposed Floor Decking to receive Paint Finish:
 - a. Provide widths with minimum thicknesses as noted on the Drawings.
 - b. Species:
 - 1) Ipe
 - c. Surfaces that will be exposed to view shall not bear grade marks or other identifying marks.

- D. Fasteners and Anchorages:
1. Fasteners exposed to the weather as well as fasteners embedded in, or in contact with, preservative treated wood shall be hot-dip galvanized.
 2. Fasteners for fire retardant-treated lumber exposed to the weather shall be copper alloy.
 3. Common wire nails shall conform to ASTM F1667.
 4. Wood screws shall conform to ASME B18.6.1.
 5. Lag screws and lag bolts shall conform to ASME B18.2.1.
 6. Anchorage devices shall conform to Section 05 50 00.
 7. Use joist hangers, framing anchors and clips where shown or specified.
 - a. Joist hangers shall be steel, zinc coated, sized to fit the supporting member, of sufficient strength to develop full strength of the supported member in accordance with applicable building code, and furnished complete with special nails required by joist hanger manufacturer.
 - b. Framing anchors shall be hot-dip galvanized steel conforming to ASTM A653/A653M, Z275 G90. Steel shall not be lighter than 18-gage. Use special nails furnished by manufacturer for nailing.
 - c. Clips shall consist of hot-dip galvanized conforming to ASTM A653/A653M, Z275 G90 steel angles, minimum 3/16-inch thick.

2.2 WOOD TREATMENT

- A. Preservative Treatment: Where lumber is specified in this Section as treated, comply with AWWA P5, "Alkaline Copper Quat Mixture". Mark each treated item to comply with AWWA quality mark requirements.
1. Pressure-treat above ground items with water-borne preservatives in accordance with AWWA U1 and AWWA T1. After treatment, kiln-dry to maximum moisture content of 19 percent. Treat materials indicated on the Drawings and the following:
 - a. Wood nailers, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - b. Wood, plates, blocking, furring, stripping, and similar concealed members and wood in contact with masonry, concrete, or steel.
 - c. Soffit and rain drainage framing.
 2. Complete the fabrication of treated items prior to treatment, wherever possible. If wood is cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment. Inspect each piece of wood after drying and discard damaged or defective pieces.
- B. Fire Retardant Treatment: Where lumber is shown as fire retardant-treated, comply with the following:
1. Fire retardants shall conform to AWWA P17. Fire retardant treatment of wood products shall conform to the requirements of AWWA U1 and AWWA T1. Treat materials indicated on the Drawings.
 2. Treated materials to be exposed to rain wetting shall be subjected to an accelerated weathering technique in accordance with ASTM D2898 prior to being tested.

3. Treated materials that will be exposed to heat or humidity, shall receive exterior retardant treatment.
4. Fire retardant treated wood shall be free of sulfates, halogens, ammonium phosphate, and formaldehyde.

2.3 FRAMING HARDWARE

- A. Fasteners and Anchoring Devices: Select and furnish items of type, size, style, grade, and class as required for secure installation of the Work. Items shall be Hot Dip galvanized or stainless steel for exterior use. Items exposed to treated wood shall be Hot-Dip galvanized conforming to ASTM Standard A653; Class G-185 or AISI 304 or AISI 316 stainless steel. Unless shown or specified otherwise, comply with the following:
1. Nails, Screws, Lag Screws/Lag Bolts, Bolts/Nuts/Washers:
 - a. Hot-Dip galvanized, ASTM Standard A653; Class G-185.
 - b. Stainless steel AISI 304 or AISI 316.
 - c. Zinc or cadmium plated.
 - d. Silicon bronze.
 2. Expansion Anchors: Hot-Dip galvanized steel wedge anchors, ASTM Standard A653; Class G-185.
 3. Toggle Bolts: Cadmium or zinc plated tumble - wing type.
 4. Self Threading Masonry Screws: Zinc Plated; "Tapcon" by Elco Industries, Inc., 1111 Samuelson Rd., PO Box 7009, Rockford, IL 61125-7009, (815) 397-5151.
 5. Bar or Strap Anchors: ASTM A575 carbon steel bars.
 6. Wall Plugs: Corrugated type, galvanized steel, 24 USS gage min, not less than 2 inches wide x 2-1/2 inches deep.
 7. Cross Bridging: Nailable type, galvanized steel, 16 USS gage min, by 3/4 inch wide.
 8. Metal Hangers and Framing Anchors: Size and type for intended use, galvanized finish, manufacturer's recommended fasteners. Items exposed to treated wood shall be Hot-Dip galvanized conforming to ASTM Standard A653; Class G-185 and epoxy coated in the field.
 9. Buck Anchors: Corrugated type, galvanized steel not lighter than 12 USS gage min, 4 inches wide (except where partitions are less than 4 inches thick) by 8 inches long, punched for two 5/16 inch carriage bolts at buck end.
 10. Sleeper Anchors: Approved type, galvanized steel not lighter than 20 USS gage min, not less than 1-1/4 inches wide, designed to anchor into concrete not less than 1-1/2 inches and permit height adjustment of sleeper.
 11. Stainless Steel Anchors: AISI 304 or AISI 316; Applications include permanent wood foundations and corrosive environments such as saltwater spray and preservative treated wood.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine substrates and supporting structure and conditions under which rough carpentry Work will be installed and notify Engineer in writing of conditions detrimental to proper

completion of the Work. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Coordination: Fit rough carpentry Work to other Work and scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow proper attachment of other construction.
- B. General:
1. Discard units of material with defects that might impair quality of the Work, and units too small to fabricate the Work with minimum joints or optimum joint arrangement.
 2. Set rough carpentry Work accurately to required levels and lines, with members plumb and true, accurately cut and fitted.
 3. Securely attach rough carpentry Work to substrates by anchoring and fastening as shown and indicated in the Contract Documents. Countersink nail heads on exposed rough carpentry Work and fill holes. Make tight connections between members.
 4. Install fasteners without splitting of wood, pre-drill as required and for masonry anchors fastened to wood stud wall framing.
- C. Wood Grounds, Nailers, and Blocking:
1. Provide where shown or indicated, and where required for attachment of other construction. Form to shapes as shown or indicated and cut as required for true line and level of Work to be attached. Coordinate location with other work involved.
 2. Attach substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise shown or indicated. Refer to Section 05 50 00.
 3. Provide permanent grounds of dressed, preservative-treated, key-bevelled lumber not less than 1.5-inch wide and of thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when no longer required.
- D. Plywood, General:
1. Install in accordance with the Contract Documents and requirements of authorities having jurisdiction.
 2. Allow for installed clearances between individual plywood panels as specified by plywood manufacturer. Provide 1/4-inch space at panel edge joints and 1/8-inch space at panel end joints, unless otherwise recommended by manufacturer.
 3. Install plywood with long dimension across supports.
 4. Install roof sheathing using 8d helical or annular nails spaced six inches at panel edges and 12 inches at intermediate framing.
 5. Provide panel edge clips at unsupported edges of roof sheathing.
 6. Sheathing and Subflooring: APA RATED SHEATHING, EXPOSURE 1. Furnish APA PS 1 veneered panels, with span ratings for the required thicknesses as listed below unless otherwise indicated.

CONTRACT No. 22-523
DIVISION 6 – WOOD, PLASTICS AND COMPOSITES

THICKNESS	SPAN RATING
3/8 inch	24/0
1/2 inch	32/16
5/8 inch	40/20
3/4 inch	48/24

– END OF SECTION –

SECTION 06 10 53 – WOOD NAILERS AND BLOCKING

PART 1 GENERAL

1.1 QUALITY ASSURANCE

- A. Mill and Producer's Stamp: Each piece of lumber shall bear a stamp indicating type, grade, mill, and grading agency.
 - 1. Pressure treated wood shall bear a stamp or tag indicating the name of the treating company, year treated, preservative used, the level of treatment, intended use (appropriate AWP Standard), and logo of inspecting company.

1.2 STORAGE

- A. Store lumber a minimum of 6 inches off the ground, in a dry, well-ventilated place, protected from the weather.

1.3 RELATED SECTIONS

- A. Section 05 50 00 – Metal Fabrications and Anchorage
- B. Section 06 10 00 – Rough Carpentry
- C. Section 06 13 23 – Heavy Timber Construction
- D. Section 06 18 00 – Timber Construction
- E. Section 06 21 00 – Glued Laminated Construction

PART 2 PRODUCTS

2.1 MATERIALS

- A. Lumber: "Standard" Grade Douglas Fir, Hem-Fir, White Pine, Southern Pine, or Spruce-Pine-Fir pressure preservative treated in accordance with the American Wood Preservers Association (AWPA) Standard U1, Commodity Specification A for the requirements listed under Use Category UC2 and kiln dried to 19 percent moisture content after treatment.
 - 1. Use Category UCFA and UCFB: Wood nailers and blocking intended for fire protection and is used in either interior weather protected (UCFA) or exterior construction, exposed to weather (UCFB).
- B. Nails, Screws, and Bolts: ASTM A653 Class G185 hot dipped galvanized, zinc or cadmium plated, or silicon bronze.
 - 1. Screws and Bolts for fastening to Aluminum: Stainless steel, Type 304 or 316.
- C. Expansion Anchors: G185 Hot dipped galvanized steel wedge anchors, FS FF-S-325, Group II, Type 4, Class 1.
- F. Toggle Bolts: Cadmium or zinc plated tumble - wing type; FS FF-B-588.

CONTRACT No. 22-523
DIVISION 6 – WOOD, PLASTICS AND COMPOSITES

- E. Self Threading Masonry Screws: Zinc Plated; “Tapcon” by Elco Industries, Inc., 1111 Samuelson Rd., PO Box 7009, Rockford, IL 61125-7009, (815) 397-5151.
- F. Separation Membrane For Aluminum Metals: Self adhering, self sealing, rubberized asphalt sheet membrane.
 - 1. Physical Properties:
 - a. Thickness: 40 mils minimum ASTM D 3767 Method A.
 - b. Tensile strength: 250 psi ASTM D 412.
 - c. Elongation (ultimate failure of the rubberized asphalt) 250% ASTM D 412 Die C Modified).
 - d. Permeance: 0.05 perms max.) ASTM E 96.
 - 2. “Ice And Water Shield” by W.R. Grace Co., 62 Whittemore Ave., Cambridge, MA 02140, (800) 354-5414; “Deck Guard” by Polyguard Products Inc., P.O. Box 755, Ennis, TX 75120, (800) 541-4994; “MetalSeal” by NEI Advanced Composite Technology, 50 Pine Road, Brentwood, NH, (800) 998-4634.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install nailers and blocking true to line and plane within a tolerance of 1/8 inch in 10 feet.
- B. Fit joints neatly with no more than 1/16 inch space between abutting members.
- C. Do not install nailers or blocking across bonding expansion joints.
- D. Attach nailers and blocking securely as required to properly support the items that will be attached to them.
- E. Space fasteners equally at not more than 16 inches on center and 4 inches from each end of each member, unless noted otherwise. Secure the nailers and blocking with the following types of fasteners:
 - 1. To Cast-In-Place Concrete, Solid Concrete Masonry Units, and Brick: Use expansion anchors or self-threading masonry screws.
 - 2. To Faces of Hollow Concrete Masonry Units: Use toggle bolts.
 - 3. To Tops of Hollow Concrete Masonry Units: Use anchor bolts extending to course below, embedded in 3000 psi concrete filled cores.
 - 4. To Wood: Use nails or screws.
 - 5. To Metal: Use bolts or self-tapping screws.
- F. Countersink fasteners if they interfere with the proper installation of items to be attached to the nailers and blocking.

3.2 APPLICATION OF SEPARATION MEMBRANE

- A. Installing Separation Membrane:
 - 1. Install 1 ply of underlayment over the entire horizontal and vertical surface of pressure treated wood nailers and blocking lapping each ply 2

CONTRACT No. 22-523
DIVISION 6 – WOOD, PLASTICS AND COMPOSITES

inches over the preceding ply so that no aluminum material comes in contact with pressure treated wood.

-END OF SECTION-

CONTRACT No. 22-523
DIVISION 6 – WOOD, PLASTICS AND COMPOSITES

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SECTION 06 13 23 - HEAVY TIMBER CONSTRUCTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- A. Section 05 50 00 – Metal Fabrications and Anchorage
- B. Section 06 10 00 – Rough Carpentry
- C. Section 06 10 53 – Wood Nailers and Blocking
- D. Section 06 21 00 – Glued Laminated Construction

1.2 DEFINITIONS

- A. Heavy timber construction is hereby defined to include wood members with thicknesses of 5 inches (nominal) or more.

1.3 REFERENCES

- A. Standards: Except as otherwise indicated, comply with "Timber Construction Standards" AITC 100 and "Recommended Practice for the Erection of Structural Timber Framing" AITC 105 by the American Institute of Timber Construction, as applicable to the Work required.
- B. Grading: Provide timber graded by a recognized agency, with rules and service complying with requirements and recommendations of the American Lumber Standards Committee and PS 20.
 - 1. Use only pieces which bear the inspection service's grade mark, except do not apply inspection service grade mark on timber shown as exposed in the Work and without painted finish. For exposed unpainted material, submit certificate of grade compliance, obtained from the mill for each shipment, directly to the Director's Representative at the site.
- C. Preservative Treatment: Comply with applicable U1 Standards of the American Wood-Preservers' Association (AWPA).
 - 1. Each piece of timber shall be stamped with the AWPA Quality Mark certifying compliance with the treatment standards specified, except do not apply AWPA Quality Mark on timber shown as exposed in the Work and without painted finish.

1.4 SUBMITTALS

- A. Action Submittals; Submit the following:
 - 1. Shop Drawings:
 - a. List of species and grade of lumber proposed for each use.
 - b. Fastener schedule with location, size, material and type of each fastener to be used in the Work.
- B. Informational Submittals: Submit the following:
 - 1. Certificates:

CONTRACT No. 20-530
DIVISION 6 – WOOD, PLASTICS AND COMPOSITES

- a. Lumber treater's certification of compliance, in accordance with Paragraph 1.04.B.1 of this Section.
 - b. Certificates of grade in accordance with Paragraph 1.04.C.2 of this Section.
 2. Tests and Evaluation Reports:
 - a. For fire retardant treated structural panels, test data and design adjustment values in accordance with ASTM D5516 and ASTM D6305.
 - b. For fire retardant treated lumber, test data and design adjustment in accordance with ASTM D5664 and ASTM D6841.
 3. Manufacturer's Instructions:
 - a. Chemical treatment manufacturer's instructions for proper use of each type of treated material.
- C. Quality Control Submittals:
1. Preservative Treatment Certification: Submit "Certificate of Treatment" by treating plant, for each shipment, indicating the species of lumber, tally, charge number, date treated, type of preservative used, and final net retention.
 2. Preservative Treatment Certification: For each shipment, submit certification by an independent Quality Control Agency recognized by the AWWA, stating that treatment complies with specified standards.
 3. Fire-Retardant Treatment Certification: Submit certification by treating plant, for each shipment, stating that treatment complies with specified standards.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Keep timbers dry during fabrication, delivery, storage, handling and erection, until the building enclosure is completed to the extent necessary for protection from the weather. Do not store in areas of either excessively high or excessively low relative humidity.
- B. Time the delivery and installation of timber Work to avoid extended on-site storage, and to avoid delaying the Work of other trades whose Work must follow the erection of timber Work.
- C. Have products delivered to Site in manufacturer's original, unopened, labeled containers. Keep Engineer informed of delivery of all products to be incorporated in the Work.
- D. Clearly mark partial deliveries of component parts of equipment to identify the equipment, to permit easy accumulation of parts and to facilitate assembly.
- E. Immediately on delivery, inspect shipment to ensure:
 1. Product complies with requirements of Contract Documents and reviewed submittals.
 2. Quantities are correct.
 3. Containers and packages are intact, labels are legible.
 4. Products are properly protected and undamaged.

CONTRACT No. 20-530
DIVISION 6 – WOOD, PLASTICS AND COMPOSITES

- F. Promptly remove damaged products from the Site and expedite delivery of new undamaged products, and remedy incomplete or lost products to provide that specified, so as not to delay progress of the Work.

1.6 PROJECT CONDITIONS

- A. Installer shall examine supporting foundations or substructures to receive timber Work, and the conditions under which the Work is to be erected and notify the Director's Representative in writing of conditions detrimental to the proper completion of the Work. Do not proceed with the installation until detrimental conditions have been corrected.
- B. Obtain necessary information from fabricator concerning heating, ventilating and air conditioning limitations in the building after erection, in order to avoid damage or deterioration of the timber Work.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Provide minimum 1,750 PSI f_b for all structural framing members shown on the Contract Drawings.
- B. General: Comply with grading rules published by recognized grading agency for the species of timber used, as follows:
 - 1. RIS - Redwood Inspection Service.
 - 2. SPIB - Southern Pine Inspection Bureau.
 - 3. WCLIB - West Coast Lumber Inspection Bureau.
 - 4. WWPA - Western Wood Products Association.
- C. Timber Species:
 - 1. Douglas Fir, Western Larch or Southern Pine, at fabricator's option.
 - 2. Hem-Fir (Hemlock or True Fir).
 - 3. California Redwood.
 - 4. Western Red Cedar.
- D. Timber Grade: For the species indicated, comply with the following grade (or grades if more than one species specified at fabricator's option):
 - 1. WWPA Grade:
 - 2. WCLIB Grade:
 - 3. SPIB Grade:
 - 4. RIS Grade:
- E. Moisture Content:
 - 1. Except as otherwise indicated, provide timber dried to a maximum moisture content of 19 percent, and include "S-DRY" or similar indication in grade marking or certification of grade.

CONTRACT No. 20-530
DIVISION 6 – WOOD, PLASTICS AND COMPOSITES

1. Except as otherwise indicated, provide timber which is unseasoned (moisture content may exceed 19 percent) and include "S-GRN" or similar indication in grade marking or certification of grade.
- F. Dressing:
1. Provide timber which has been dressed on 4 sides (S4S) at the mill, prior to grading. Comply with grade sizes.
 1. Except as otherwise indicated, provide timber which is rough sawn (RGH-Tmb) (undressed) at the mill and at time of grading. Comply with grade sizes.
- G. Sealers:
1. End Sealer: Transparent colorless wood sealer, which is effective in retarding the transmission of moisture (both in and out) at cross-grain cuts in timber Work.
 2. Penetrating Sealer: Translucent penetrating wood sealer, which will not interfere with application of wood stain and transparent finish, or paint finish, as indicated for the Work. Refer to Section 09 91 01 for required finishes.
- H. Metal Connectors, Anchors and Accessories: Provide fabricated structural steel (ASTM A 36) shapes, plates and bars, welded into assemblies of the types and sizes indicated or, if not indicated, manufacturer's standard units for the timber sizes indicated, with steel bolts (ASTM A 307), lag bolts (FS FF-B-561) and other standard fasteners as required.
1. Finish: Except as otherwise indicated, finish each assembly and fastener prior to use by hand-tool cleaning (SSPC-SP 2), solvent cleaning (SSPC-SP 1), phosphate pretreatment (SSPC-PT 4), and painting with rust-inhibitive primer (FS TT-P-1757, Type II), 2.0 mils dry film thickness.
 2. Finish each assembly and fastener unit with hot-dip zinc coating (ASTM A153).
 3. Finish each assembly and fastener unit exposed to treated wood with hot-dip zinc coating; ASTM A653, Class G-185. All metal hangers and framing anchors to be epoxy coated in addition to Class G-185 galvanizing.

2.2 FABRICATION

- A. Camber:
1. Fabricate horizontal and angular members (units of less than 12 to 12 slope) with the natural convex bow (crown) up, so as to provide camber in the Work.
 2. Where members are shown to be "Cambered", trim top surfaces from center to ends to provide either circular or parabolic camber, amounting to 1/180 of the span for the unloaded member, working each member with its natural convex bow (crown) up. Trim bottom surface of each "Cambered" member to be parallel with top surface.

CONTRACT No. 20-530
DIVISION 6 – WOOD, PLASTICS AND COMPOSITES

- B. Fabricate members by cutting and restoring exposed surfaces to match specified surfacing. Pre-drill for fasteners and the assembly of units wherever feasible. Machine sand exposed surfaces to remove planing or surfacing marks, finishing with No. 120 grit sand paper.
- C. Shop Fabrication: Where treatment of timber Work is indicated, fabricate members (cut, drill, surface and sand) prior to treatment, to the greatest extent possible. After cutting, restore exposed surfaces to match specified surfacing and finish all exposed surfaces by machine sanding with No. 120 grit sandpaper.

2.3 PRESERVATIVE TREATMENT

- A. Pressure treat fabricated timber members with oil-borne preservative in accordance with AWPA Standard P.
 - 1. Provide water repellent additive in preservative solution, complying with the standard.
 - 2. Provide preservative treatment solution which is free of water repellents and other substances which might interfere with application of finishes indicated for the timber Work.
- B. Pressure treat fabricated timber members with water-borne preservative in accordance with AWPA Standard P.

2.4 FIRE-RETARDANT TREATMENT (FR-S)

- A. Pressure impregnate each fabricated timber member with fire-retardant chemicals in accordance with AWPA recommended practice C-20, to achieve a flame spread rating not higher than 25 for a 30-minute test complying with UL Test 723, NFPA Test 255 or ASTM E 84.
 - 1. Provide type of chemicals which will not bleed through finish or adversely affect bond of finish indicated for timber Work.
 - 2. After treatment, kiln dry timbers to an average moisture content of 19%. Inspect each member and discard units which have been twisted, bowed, excessively checked, or otherwise adversely affected by treatment.
 - 3. Provide UL label on each unit treated, including "FR-S" rating.

2.5 END-CUT SEALING

- A. Immediately after end-cutting each member to final length, and after wood treatment (if any), apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping surfaces "flood-coated" for not less than 10 minutes.

2.6 SEAL COAT

- A. After complete fabrication and surfacing of each unit, wood treatment (if any), and end-cut sealing, apply a heavy saturation coat of penetrating sealer on all surfaces of each unit, except for treated wood where the treatment has included a water repellent.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine substrates and supporting structure and conditions under which rough carpentry Work will be installed and notify Engineer in writing of conditions detrimental to proper completion of the Work. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. General: Comply with AITC 105.
- B. Cutting: Avoid cutting (after fabrication) to the greatest extent possible.
 - 1. Coat erection cross cuts with end sealer.
 - 2. Where treated members must be cut during erection, apply a heavy brush coat of the same treatment solution to the cut surfaces in accordance with AWPAs Standard M4.
- C. Handle and temporarily support members with protective blocking and slings to prevent surface damage which will be visible after completion of the Work.
- D. Maintain expansion spaces as shown, and as required by applicable AITC standards.
- E. Repair damaged surfaces and finishes after completion of erection, or replace damaged members as directed where damage is beyond satisfactory repair.

- END OF SECTION -

SECTION 06 18 00 – TIMBER CONSTRUCTION

PART 1 GENERAL

1.1 DESCRIPTION

- A. This section describes furnishing, framing, treating, delivering, erecting, and painting if required, treated lumber and timber required for timber structures.

1.2 RELATED SECTIONS

- A. Section 06 10 00 – Rough Carpentry
- B. Section 06 10 53 – Wood Nailers and Blocking
- C. Section 06 13 23 – Heavy Timber Construction
- D. Section 06 21 00 – Glued Laminated Construction

1.3 REFERENCES

- A. ANSI/AITC A 190.1: American National Standard for Wood Products – Structural Glued Laminated Timber by American National Standards Institute, Inc.
- B. User Specification for Treated Wood, American Wood Protection Association Standard (AWPA) U1-02.
- C. AWS D1.1: Structural Welding Code
- D. AITC 105: Recommended Practice for the Erection of Structural Timber Framing by the American Institute of Concrete Construction.

1.4 SUBMITTALS

- A. Shop Drawings: Machine-duplicated copies of Contract Drawings will not be accepted as shop drawings. Shop drawings shall be prepared by the manufacturer. Failure to submit legible drawings will be cause for disapproval without review.
- B. Shop drawings shall include the following:
 - 1. Drawings of proposed job standards for shop and field connections.
 - 2. Erection drawings and framing plans indicating sizes and locations of all members with dimensional information.
 - 3. Anchor bolt and bearing plate plans.
 - 4. Detailed drawings, other than for anchor bolts and bearing plates.
- C. Product Data: Manufacturer’s catalog sheets, specifications, storage instructions, and installation instructions for timber members, metal connectors, and bolts.
- D. Quality Control Submittals:
 - 1. Certificates: Affidavits required under Quality Assurance Section 1.5 below.
 - 2. Manufacture’s Qualifications Data:

- a. Name and address of proposed manufacturer.
 - b. Evidence that the proposed manufacture meets the requirements of Quality Assurance Section 1.5 below.
3. Erector's Qualifications Data:
- a. Name of proposed Supervisor who will be supervising the erection.
 - b. Employer's name, business address, and telephone numbers.
 - c. Name and addresses of the required number of similar projects that the Supervisor has worked on which meet the experience criteria.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: The manufacturer shall be an AITC licensed firm, qualified to issue the AITC "Quality Inspected" mark.
- B. Erector's Qualifications: The Supervisor for the erection of the structural timber members shall be personally experienced in erecting structural timber members and shall have worked on 5 similar projects during the past 3 years.
- C. Certifications:
 1. Furnish manufacturer's certification that the timber members conform to the requirements of ANSI/AITC A190.1
 2. Furnish treating plant's certification that exterior members have been pressure preservative treated in accordance with the specified standards.
- D. Quality Marks: Mark each member with a "Quality Inspected" mark indicating conformance with ANSI/AITC A 190.1. Place mark on member surface which will not be exposed in the completed work.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Maintain factory applied protective covering in the weather-tight condition or provide other weather-tight protection until the building is enclosed to the extent necessary to protect interior timber members.
- B. Do not use clear polyethylene film weather covering directly over exposed wood surfaces.
- C. Do not use timber members where the manufacturer's recommended humidity levels will be exceeded.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Lumber: Comply with ANSI/AITC A 190.1
 1. Species:
 - a. Douglas Fir-Coastal
 - b. Southern Pine

CONTRACT No. 22-523
DIVISION 6 – WOOD, PLASTICS AND COMPOSITES

- c. Hem-Fir
 - d. Eastern White Pine
 - e. Red Oak
 - f. White Oak
 - g. Alaska Yellow Cedar
 - 2. Condition of Use:
 - a. Timbers shall be dried in a radio frequency kiln to a maximum moisture content of 19%.
 - 3. Stress Rating at 19% percent maximum moisture
 - a. Use minimum 1750 PSI f_b for all structural framing members shown on the Contract Drawings.
 - b. Use 1200 PSI f_b for all non-structural framing members including:
 - 1. Nailing Strips
 - 2. Shims
 - 4. Appearance:
 - a. Premium Grade.
 - 5. Adhesive: ASTM D2559, wet-use adhesive.
- B. Metal Connectors: ASTM A36 structural steel.
- 1. Connectors exposed to treated wood shall be Hot-dip galvanized conforming to ASTM Standard A653; Class G-185 and epoxy coated.
- C. High-Strength Threaded Fasteners (High-Strength Bolts): ASTM A 325 heavy hexagon structural bolts, nuts and hardened washers.
- 1. Fasteners exposed to treated wood shall be Hot-dip galvanized conforming to ASTM Standard A653; Class G-185.
- D. Common Bolts: ASTM A 307
- 1. Bolts exposed to treated wood shall be Hot-dip galvanized conforming to ASTM Standard A653; Class G-185.
- E. Anchor Bolts: ASTM A36; or ASTM A675, Grade 70.
- 1. Bolts exposed to treated wood shall be Hot-dip galvanized conforming to ASTM Standard A653; Class G-185.
- F. Rust Inhibitive Primer: Factory-packaged primer. Acceptable manufacturers include:
- 1. Tnemec 10-99
 - 2. Rust-Oleum 769
 - 3. Valspar 13-R-53
 - 4. Or approved equal.

2.2 PRESSURE PRESERVATIVE TREATMENT

- A. Comply with AWWA U1 Standards.
 - 1. Pressure preservative treat any members exposed to grade.

2.3 FABRICATION

- A. Timber Members: Fabricate in accordance with ANSI/AITC 190.1 to the sizes and shapes indicated on the Drawings.
- B. Ensure structural lumber and timber are straight, sawed squared at the ends, and have opposite surfaces parallel.
- C. Saw rough structural lumber and timber to the nominal dimensions specified in AITC. Occasional slight variation is permissible, however, ensure that the specified minimum dressed dimensions are met everywhere along the length.
- D. Ensure that lumber and timber required to conform to a specific stress grade shows a copyrighted stamp on each piece designating the inspecting agency, inspector, or mill and grade, or furnish a certificate of inspection to the Engineer for untreated material, or to the department inspector at the treating plant for treated material. Include the kind and grade of material and the name of the grading agency.
- E. The manufacturer may surface structural lumber and timber ordered rough, if thicker than specified, to a rough stocky thickness.
- F. Metal Connectors: Form and weld into shapes indicated. Welding shall comply with the AWS code.
 - 1. Finish: Thoroughly clean all surfaces of metal. Remove oil, grease, and similar contaminants in accordance with SSPC SP-1 “Solvent Cleaning”. Remove loose mill scale, loose rust, weld slag and spatter and other detrimental material in accordance with SSPC SP-2 “Hand Tool Cleaning”, SSPC SP-3 “Power Tool Cleaning”, or SSPC SP-7 “Brush-Off Blast Cleaning”. Paint prepared units with rust inhibitive primer with minimum 5.0 mil wet film thickness.
- G. Provide square head and nuts for roof framing connections unless specified otherwise. Ensure the threads on the bolts are U.S Standard and not less than 2 ½ times the diameter of the bolt in length.

2.4 FACTORY APPLIED PROTECTION

- A. Protect timber members before shipping by wrapping each member with factory applied, durable, water resistant, plastic coated paper covering, with water resistant seams.
 - 1. Bundle-wrap small members of uniform size, with protective slip sheets between members.

PART 3 EXECUTION

3.1 ERECTION

- A. Comply with AITC 105 except as shown or specified otherwise. Install timber members in designated positions indicated on the Drawings.

CONTRACT No. 22-523
DIVISION 6 – WOOD, PLASTICS AND COMPOSITES

- B. Do not cut timber members during erection except for fastener drilling or other approved minor cutting. Field coat cut surfaces with stain and sealer materials used at manufacturing plant.
 - 1. Preservative Treated Members: Apply heavy brush coat of same treatment material to cut surfaces; Comply with AWWPA C28.
- C. Temporarily support members with protective slings and blocking to prevent damage to surfaces visible after erection.
- D. Do not remove protective wrappings or coverings from members until timber members are protected from the weather and from damage or defacement from activities of other trades. Retain wrappings as shields from defacement by painting, and similar operations.

– END OF SECTION –

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SECTION 06 21 00 - GLUED LAMINATED CONSTRUCTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- A. Section 06 10 00 – Rough Carpentry
- B. Section 06 13 23 – Heavy Timber Construction

1.2 REFERENCES

- A. ANSI/AITC A 190.1: American National Standard for Wood Products - Structural Glued Laminated Timber by American National Standards Institute, Inc.
- B. ASTM D 2559: Standard Specification for Adhesives for Structural Laminated Wood Products for Use Under Exterior (Wet Use) Exposure Conditions.
- C. User Specification for Treated Wood, American Wood Protection Association Standard (AWPA) U1-02.
- D. AWS D1.1: Structural Welding Code-Steel by the American Welding Society.
- E. AITC 105: Recommended Practice for the Erection of Structural Timber Framing by the American Institute of Timber Construction.

1.3 SUBMITTALS

- A. Shop Drawings: Machine-duplicated copies of Contract Drawings will not be accepted as shop drawings. The title block shall be placed in the lower right hand corner of the drawing, and shall contain the manufacturer's name and address. Shop drawings shall be prepared by the manufacturer. Failure to submit legible drawings of required size will be cause for their disapproval without review.
 - 1. Early Submission: Include the following:
 - a. Drawings of proposed job standards for shop and field connections.
 - b. Erection drawings indicating sizes and locations of all members.
 - c. Anchor bolt and bearing plate plans.
 - 2. Submit detail drawings, other than for anchor bolts and bearing plates, after approval of the job standards and the erection drawings.
 - 3. Indicate shop and field welds by Standard AWS Welding Symbols in accordance with AWS A2.4.
 - 4. When shop drawings are marked "Make Corrections Noted", promptly resubmit copies of corrected shop drawings for formal approval and record.
- B. Product Data: Manufacturer's catalog sheets, specifications, storage instructions, and installation instructions for glued laminated members, metal connectors, and bolts.

CONTRACT No. 22-523
DIVISION 6 – WOOD, PLASTICS AND COMPOSITES

- C. Quality Control Submittals:
 - 1. Certificates: Affidavits required under Quality Assurance Article.
 - 2. Manufacturer's Qualifications Data:
 - a. Name and address of proposed manufacturer.
 - b. Evidence that the proposed manufacturer meets the requirements of the Quality Assurance Article.
 - 3. Erector's Qualifications Data:
 - a. Name of proposed Supervisor who will be supervising the erection.
 - b. Employer's name, business address, and telephone number.
 - c. Names and addresses of the required number of similar projects that the Supervisor has worked on which meet the experience criteria.

1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: The manufacturer shall be an AITC licensed firm, qualified to issue the AITC "Quality Inspected" mark.
- B. Erector's Qualifications: The Supervisor for the erection of the structural glued laminated members shall be personally experienced in erecting structural glued laminated members and shall have worked on 5 similar projects during the past 3 years.
- C. Certifications:
 - 1. Furnish manufacturer's certification that the glued laminated members conform to the requirements of ANSI/AITC A 190.1.
 - 2. Furnish treating plant's certification that exterior members have been pressure preservative treated in accordance with specified standards.
- D. Quality Marks: Mark each member with a "Quality Inspected" mark indicating conformance with ANSI/AITC A 190.1. Place mark on member surface which will not be exposed in the completed Work.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Maintain factory applied protective covering in the weather-tight condition or provide other weather-tight protection until the building is enclosed to the extent necessary to protect interior glued laminated members.
- B. Do not use clear polyethylene film weather covering directly over exposed wood surfaces.
- C. Do not store glued laminated members where the manufacturer's recommended humidity levels will be exceeded.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Lumber: Comply with ANSI/AITC A 190.1.
 - 1. Species: Southern Pine, Douglas Fir-Larch, or Hem-Fir
 - 2. Laminating Combinations: Comply with ANSI/AITC A 190.1 and the following allowable design values:
 - a. Allowable bending stress (Fb): 3,100 psi
 - b. Allowable axial tensile stress (Ft): 2,150 psi
 - c. Compression parallel to grain (Fc): 3,000 psi
 - d. Compression perpendicular to grain (FcI): 750 psi
 - e. Allowable stress shear (Fv): 285 psi
 - f. Modulus of elasticity (E): 2.1×10^6
 - 3. Condition of Use:
 - a. Dry condition of service (when the moisture content of the member will be at or below 16 percent in service).
 - 4. Appearance:
 - a. Architectural Grade.
 - 5. Adhesive: ASTM D 2559, wet-use adhesive.
- B. Metal Connectors: ASTM A 36 structural steel.
 - 1. Connectors exposed to treated wood shall be Hot-Dip galvanized conforming to ASTM Standard A653; Class G-185 and epoxy coated.
- C. High-Strength Threaded Fasteners (High-Strength Bolts): ASTM A 325 heavy hexagon structural bolts, nuts, and hardened washers.
 - 1. Fasteners exposed to treated wood shall be Hot-Dip galvanized conforming to ASTM Standard A653; Class G-185.
- D. Common Bolts: ASTM A 307.
 - 1. Bolts exposed to treated wood shall be Hot-Dip galvanized conforming to ASTM Standard A653; Class G-185.
- E. Anchor Bolts: ASTM A 36; or ASTM A 675, Grade 70.
 - 1. Bolts exposed to treated wood shall be Hot-Dip galvanized conforming to ASTM Standard A653; Class G-185.
- F. Rust Inhibitive Primer: Factory-packaged steel primer selected from the following:
 - 1. Tnemec 10-99 (Red), 10-99G (Green) or 10-1009 (Gray).
 - 2. Rust-Oleum 769.
 - 3. Valspar 13-R-53.
 - 4. Sherwin-Williams Kromik.

2.2 PRESSURE PRESERVATIVE TREATMENT

- A. Comply with AWWA U1 Standards. Treat lumber prior to gluing.
 - 1. Pressure Preservative treat exterior members.

CONTRACT No. 22-523
DIVISION 6 – WOOD, PLASTICS AND COMPOSITES

2.3 FABRICATION

- A. Glued Laminated Members: Fabricate in accordance with ANSI/AITC 190.1 to the sizes and shapes indicated on the Drawings.
 - 1. Finish: Factory finish all surfaces of glued laminated members with manufacturer's standard penetrating acrylic stain and sealers.
 - a. Color: As selected by the Director from the manufacturer's standard colors.
- B. Metal Connectors: Form and weld into shapes indicated. Welding shall comply with the AWS Code.
 - 1. Finish: Thoroughly clean all surfaces of metal. Remove oil, grease, and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning". Remove loose mill scale, loose rust, weld slag and spatter, and other detrimental material in accordance with SSPC SP-2 "Hand Tool Cleaning", SSPC SP-3 "Power Tool Cleaning", or SSPC SP-7 "Brush-Off Blast Cleaning". Paint prepared units with rust inhibitive primer. Provide 5.0 mil wet film thickness.

2.4 FACTORY APPLIED PROTECTION

- A. Protect glued laminated members before shipping by wrapping each member with factory applied, durable, water resistant, plastic coated paper covering, with water resistant seams.
 - 1. Bundle-wrap small members of uniform size, with protective slip sheets between members.

PART 3 EXECUTION

3.1 ERECTION

- A. Comply with AITC 105 except as shown or specified otherwise. Install glued laminated units in designated positions indicated on the Drawings.
- B. Do not cut glued laminated members during erection except for fastener drilling or other approved minor cutting. Field coat cut surfaces with stain and sealer materials used at manufacturing plant.
 - 1. Preservative Treated Members: Apply heavy brush coat of same treatment material to cut surfaces; Comply with AWPA C 28.
- C. Temporarily support members with protective slings and blocking to prevent damage to surfaces visible after erection.
- D. Do not remove protective wrappings or coverings from members until glued laminated units are protected from the weather and from damage or defacement from activities of other trades. Retain wrappings as shields from defacement by painting, and similar operations.

- END OF SECTION -

SECTION 06 40 13 - EXTERIOR ARCHITECTURAL WOODWORK

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the architectural woodwork as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Provide exterior architectural woodwork (non-structural):
 - a. Exterior wood trim and soffits.
 - b. Wood column enclosures.
 - c. Wood posts, railings, fencing and gates.
 - d. Cellular PVC trim and Fascia.
 - e. Fiberglass base for columns.
 - 2. Wood framing and rough lumber as required for work of this Section.
 - 3. Wood grounds, blocking, nailers, furring as required for work of this Section.
 - 4. All rough hardware and fastenings for work of this Section.
 - 5. Drilling concrete and masonry, drilling and/or tapping metal work, as required, for the installation of work of this Section.
 - 6. Shop finish of work of this Section, except items indicated herein to be shop primed only.

1.3 RELATED SECTIONS

- A. Rough Carpentry - Section 061000.
- B. Wood Siding - Section 074623.
- C. Fiber Cement Siding - Section 074646.
- D. Sheet Metal Flashing - Section 076200.
- E. Painting and Finishing - Section 099100.

1.4 QUALITY STANDARDS

- A. The quality standards of the Architectural Woodwork Institute, "Architectural Woodwork Standards" (AWS), 2nd Edition, dated July 1, 2016, shall apply to all workmanship, including materials and installation, for architectural woodwork, and by reference are made a part of this specification. All work shall conform to "Premium" grade requirements of the AWS unless otherwise modified herein.

- B. In the event of a dispute as to the quality grade (or grades), the Contractor shall call upon the Architectural Woodwork Institute for an inspection under AWI's Quality Certification Program which shall include a QCP Inspection and Report. The Contractor agrees to abide by the decision of this Report. The cost of said inspection and report shall be borne by the Contractor.
- C. Employ only tradesmen experienced in the fabrication and installation of architectural woodwork.
- D. Woodworking firm must be accredited by the AWI Quality Certification Program (QCP).

1.5 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.
 - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.
- B. Shop Drawings: Provide shop drawings for each type of trim profile indicated.
 - 1. Shop drawings shall indicate all materials, thicknesses and finishes.
 - 2. Shop drawings shall show all finish hardware, anchors, fastenings and accessories.
 - 3. Where architectural woodwork deviates from AWI standards noted herein, shop drawings must identify these deviations.
- C. Samples: Submit samples of each of the following items:
 - 1. Each exposed product involving selection of colors, profiles, or textures.
 - 2. Each type and finish of each type of wood or polyurethane trim, twelve (12) inches long, finish as specified.

1.6 QUALIFICATIONS

- A. The work of this Section shall be provided by a firm having a minimum of five (5) years' experience on projects of similar size and quality to that specified and shown.

1.7 COORDINATION

- A. Coordinate the work of this Section with other appropriate Sections of the specifications to insure proper scheduling for fabrication and installation of the work specified herein.
- B. Coordinate with partition and finish trades to insure that proper provisions are made for the installation of the work specified herein.
- C. Verify all dimensions in the field prior to fabrication of all Architectural Woodwork to assure proper fit.

1.8 PRODUCT HANDLING

- A. All materials and work of this Section shall be protected from damage from time of shipment from shop to final acceptance of work. Cover, ventilate, and protect work of this Section from damage caused by weather, moisture, heat, staining, dirt, abrasions, any other causes which may adversely affect appearance or use, or which may cause deterioration of finish, warping, distortion, twisting, opening of joints and seams, delamination, loosening, etc., of work of this Section.
- B. Keep all finish carpentry work under cover both in transit and at the premises. Do not deliver any finish carpentry work before it is required for installation. Protect such work to avoid damage in transit, during erection and after erection until acceptance of the building; use all such methods to provide the proper protection. Remove such protection when directed by the Architect.
- C. Deliver finish carpentry work in a dry stable condition; protect same against injury and dampness.
- D. Damaged or defective items of work of this Section are subject to rejection and replacement with new by Contractor, at no cost to Owner.

1.9 JOB CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration

PART 2 PRODUCTS

2.1 WOOD MATERIALS

- A. Provide materials in the quantities needed for the work as shown on the drawings, and meeting or exceeding the following standards of quality:
- B. Lumber: DOC PS 20 and applicable grading rules of inspection agencies certified by ALSC's Board of Review.
 - 1. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
 - 2. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by inspection agency.
- C. Hardboard: AHA A135.4.
- D. Wood Treatment

1. For blocking and nailers, pressure treat wood with copper azole, Type A (CBA-A); ammoniacal copper quat (ACQ) or similar preservative product that contains no arsenic or chromium. Preservative shall comply with AWPB Standard C-2 for lumber and C-9 for plywood, (0.25 lbs./cubic foot of chemical in wood).
 - a. After treatment, kiln dry to a maximum moisture content of 15 percent. Treatment shall be equal to “Wolmanized Natural Select” made by Arch Wood Protection Inc. or approved equal.
2. Treated wood which is cut or otherwise damaged shall be further treated in accordance with the AWPB Standard M-4.

E. Finish: Exterior grade paint finish, to be approved through mock-up procedure.

2.2 INSTALLATION MATERIALS

- A. Blocking, Shims, and Nailers: Softwood or hardwood lumber, pressure-preservative treated, kiln dried to less than 15 percent moisture content.
- B. Nails: Bronze.
- C. Screws: Bronze, countersunk.
- D. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide stainless steel anchors and inserts, unless otherwise indicated. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
- E. Gate Hardware: Provide heavy-duty hinges, locking gate hardware, latches, pulls, and push plates, as concealed as possible while allowing for the proper functioning and securing of gate. Hardware finish to be satin stainless steel BMHA 630 or US 32D unless noted otherwise.

2.3 FABRICATION, GENERAL

- A. Wood Moisture Content: 9 to 15 percent.
- B. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 1. Edges of Solid Wood (Lumber) Members 3/4" Thick or Less: 1/16".
 2. Edges of Rails and Similar Members More Than 3/4" Thick: 1/8".
- C. Complete fabrication, including assembly and finishing, 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.
- D. Shop cut openings, to maximum extent possible, to receive electrical work and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and seal with a water-resistant coating suitable for exterior applications.

CONTRACT No. 22-523
DIVISION 6 – WOOD, PLASTICS, AND COMPOSITES

2.4 EXTERIOR TRIM AND SOFFITS

A. Lumber Trim for Painted Finish

1. Species and Grade: Eastern white pine, eastern hemlock-balsam fir-tamarack, eastern spruce, or white woods; NeLMA, NLGA, WCLIB, or WWPA, Premium quality.
2. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
3. Finger Jointing: Not allowed.
4. Face Surface: Surfaced (smooth).
5. Factory Priming: Factory coated on both faces and all edges, with exterior primer compatible with topcoats specified.

- B. Exterior Soffit Board: Board for exterior soffits shall be exterior grade A plywood, species as selected by the Architect.

2.5 POSTS, RAILINGS AND FENCING

- A. Material: White Pine or Redwood, free of knots and checks, smooth finish, ready for painting.

2.6 EXTERIOR SIMULATED WOODWORK

- A. Cellular PVC Trim: Extruded, expanded PVC with a small-cell microstructure, recommended by manufacturer for exterior use, made from UV- and heat-stabilized rigid material, as manufactured by Fypon, Azek, or approved equal.
1. Adhesive for Cellular PVC Trim: Product recommended by trim manufacturer.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where exterior architectural woodwork is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 FRAMING

- A. Use specified framing lumber, sizes and spacing as indicated on drawings and as required to support loads.
- B. Framing shall be cut square on bearings, closely fitted, accurately set to required lines and levels, rigidly secured in place at bearings and connection with nails, lag screws and/or bolts as required by conditions.

CONTRACT No. 22-523
DIVISION 6 – WOOD, PLASTICS, AND COMPOSITES

3.3 GROUNDS, BLOCKING, NAILERS AND FURRING

- A. Provide all wood grounds, blocking, nailers, furring, and the like for work of this Section, where shown and where required, dressed to size indicated or required to suit the condition. Install grounds, blocking, nailers, furring, etc., rigidly, in proper alignment, trued with a long straight edge.

3.4 ROUGH HARDWARE

- A. Provide all rough hardware, such as nails, screws, bolts, anchors, hangers, clips and similar items. Hardware shall be of the proper size and kind to adequately secure the work together and in place, in a rigid and substantial manner. Use galvanized hardware at exterior walls, and at other locations where subject to moisture or where water will be present.
- B. Secure wood to concrete and to solid masonry with countersunk bolts in expansion sleeves or other approved manner, to steel with countersunk bolts, to hollow masonry and to drywall with heavy duty countersunk toggle bolts. Space fastenings not more than sixteen (16) inches apart. Hardened cut nails, power-driven fastenings, or other suitable devices may be used where approved by the Architect.
- C. Connections and fastenings shall be made in such manner as will compensate for swelling and shrinkage and shall permit the work to remain permanently in place without any splitting or opening of joints.

3.5 GENERAL INSTALLATION

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
- B. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level (including countertops), and with 1/16" maximum offset in flush adjoining surfaces, 1/8" maximum offset in revealed adjoining surfaces.
- C. Scribe and cut work to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.
- D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation.

3.6 WOOD TRIM

- A. Install flat-grain lumber with bark side exposed to weather.
- B. Install cellular PVC trim to comply with manufacturer's written instructions.
- C. Install trim with minimum number of joints as is practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24" long, except where necessary.
 - 1. Use scarf joints for end-to-end joints.
 - 2. Stagger end joints in adjacent and related members.

CONTRACT No. 22-523
DIVISION 6 – WOOD, PLASTICS, AND COMPOSITES

- D. Fit exterior joints to exclude water.
 - 1. Cope at returns and miter at corners to produce tight-fitting joints, with full-surface contact throughout length of joint.
 - 2. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.
- E. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
- F. Wood shall receive finish as specified in Section 099100, "Painting and Finishing."

3.7 EXTERIOR RAILING INSTALLATION

- A. Balusters: Fit to railings, glue and nail in place. Countersink fastener heads, fill flush, and sand filler.
- B. Newel Posts: Secure to stringers and risers with through bolts.
- C. Railings: Secure wall rails with metal brackets. Fasten freestanding railings to newel posts and to trim at walls with countersunk-head wood screws or rail bolts.

3.8 PAINTING AND FINISHING

- A. General: All painting and finishing work of this Section shall be shop applied, unless otherwise noted, as specified below. All painting and finishing shall match approved samples. Field finish painting, where specified below, shall be by painting Subcontractor, as specified for in Painting Section.
- B. Field Touch-Up: Field touch-up shall be the responsibility of the installing Subcontractor and shall include the filling and touch-up of exposed job made nail or screw holes, refinishing of raw surfaces resulting from job fitting, repair of job inflicted scratches and mars, and final cleaning up of the finished surfaces.

3.9 CLEAN UP AND PROTECTION

- A. Clean Up: At regular intervals during the course of the work, all debris and excess material shall be cleaned up and removed from the site. Upon completion of installation, clean all spaces of debris caused by woodwork installation.
- B. Protection: Protect all woodwork from marring, defacement of other damage until final completion and acceptance of the project by the Owner. Repair or replace all defective units prior to final inspection as directed by the Architect. Any units that cannot be satisfactorily repaired in the opinion of the Architect shall be replaced with new units of same original design, at no additional cost to the Owner.

END OF SECTION

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SECTION 06 64 00 - FIBERGLASS REINFORCED PLASTIC PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide fiberglass reinforced plastic (FRP) panels for wall and ceiling applications as indicated on the drawings.
- B. Related Sections: Coordinate with work of other sections including the following:
 - 1. Section 09 29 00 – Gypsum Drywall.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's literature including product characteristics, accessories and limitations.
- B. Selection Samples: Submit samples of colors and finishes.
- C. Industry Certifications and Standards: Submit copy of documentation indicating compliance.

1.3 QUALITY ASSURANCE

- A. Testing Agency: FM Approvals.
- B. Installer Qualifications: Experience completing a minimum five projects of similar size, type, and complexity. Workers employed on this Project competent in techniques required by manufacturer for installation indicated.
- C. Manufacturer: Minimum of 5-years experience manufacturing similar products.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials and products in unopened factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.6 WARRANTY

- A. Manufacturer's Warranty: Provide manufacturer's standard warranty against defects in manufacturing.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.

2.2 FIBERGLASS REINFORCED PLASTIC PANELS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide FRP ‘The Classic Collection’ by Panolam Industries International, Inc., or comparable product by one of the following:
1. Crane Composites, Inc
 2. Marlite
- B. Panels shall comply with the following:
1. Color: As selected by Architect from manufacturer's full range
 2. Surface Texture: Embossed.
 3. Surface-Burning Characteristics: As follows when tested by a qualified testing agency according to ASTM E84. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 4. Thickness: Not less than 0.090 inches. (2.3 mm)
 5. Accessories: Color matched dividers, outside corners, inside corners, end caps and fastening rivets.
 6. Adhesive: As recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install products in strict accordance with manufacturer’s instructions and approved submittals.
1. Clean substrate of dirt, dust, waxes, and other bond breaking substances prior to beginning installation.
 2. Install panels with bottom edge located to clear top of resilient base.
 3. Apply adhesive uniformly using adhesive manufacturers recommended trowel to the entire back of panels completely to the edge (100% coverage).

4. Lay FRP panels in place leaving approximately 1/8 inch between panels and 1/4 inch space top and bottom.
5. Follow adhesive manufacturer's recommendations for set and application times.
6. Apply pressure to entire panel face with laminate type roller, removing trapped air and ensure proper adhesion between surfaces.

3.3 ADJUSTING AND CLEANING

- A. Replace installations out of plumb and not aligned with adjacent panels and construction.
- B. Clean panel face to remove soiling, stains, dust, and dirt using clean rags, and cleaning agents as instructed by manufacturer.
- C. Leave installation clean, free of residue and debris resulting from work of this section.

END OF SECTION

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SECTION 07 01 50. 22

PREPARATION FOR REROOFING

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. Full tear-off of roof system at areas indicated on Drawings.
 - 2. Removal of flashings and counterflashings as required.

1.3 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

1.4 PREINSTALLATION MEETINGS

- A. Preliminary Roofing Conference: Before starting removal Work, conduct conference at mutually agreed location.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing tear-off, including, but not limited to, the following:
 - a. Reroofing preparation, including roofing system manufacturer's written instructions.
 - b. Temporary protection requirements for existing roofing system components that are to remain.
 - c. Existing roof drains and roof drainage during each stage of reroofing, and roof-drain plugging and plug removal.
 - d. Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to avoid delays.
 - e. Existing roof deck conditions requiring Architect notification.
 - f. Existing roof deck removal procedures and Owner notifications.
 - g. Condition and acceptance of existing roof deck and base flashing substrate for reuse.
 - h. Structural loading limitations of roof deck during reroofing.
 - i. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that affect reroofing.

- j. HVAC shutdown and sealing of air intakes.
- k. Shutdown of fire-suppression, -protection, and -alarm and -detection systems.
- l. Asbestos removal and discovery of asbestos-containing materials.
- m. Governing regulations and requirements for insurance and certificates if applicable.
- n. Existing conditions that may require Architect notification before proceeding.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

- 1. Include certificate that Installer is approved by warrantor of existing roofing system.
- 2. Include certificate that Installer is licensed to perform asbestos abatement.

- B. Field Test Reports:

- 1. Fastener pull-out test report.

- C. Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces that might be misconstrued as having been damaged by reroofing operations.

- 1. Submit before Work begins.

- D. Landfill Records: Indicate receipt and acceptance of demolished roofing materials and any hazardous wastes, such as asbestos-containing materials, by a landfill facility licensed to accept them.

1.7 CLOSEOUT SUBMITTALS

- A. Certified statement from the roof manufacturers of roof (to remain) and all roofs adjacent to the roof replacement scope, stating that existing roof warranties have not been affected by Work performed under this Section.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Approved by warrantor of existing roofing system to work on existing roofing.

- B. Regulatory Requirements:

- 1. Comply with governing EPA notification regulations before beginning roofing removal.
- 2. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.9 FIELD CONDITIONS

- A. Existing Roofing System: Varies by building. Multiple layers and types of roofing and existing re-cover will be encountered.
- B. Owner may occupy portions of building immediately below reroofing area.
 - 1. Conduct reroofing so Owner's operations are not disrupted.
 - 2. Provide Owner with not less than 72 hours' written notice of activities that may affect Owner's operations.
 - 3. Coordinate work activities with Owner so Owner has adequate advance notice to place protective dust and water-leakage covers over sensitive equipment and furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below work area.
 - 4. Before working over structurally impaired areas of deck, notify Owner to evacuate occupants from below affected area.
 - a. Verify that occupants below work area have been evacuated before proceeding with work over impaired deck area.
- C. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.
- D. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
- E. Conditions existing at time of inspection for bidding will be maintained by Owner as far as practical.
- F. Limit construction loads on existing roof areas to remain, and existing roof areas scheduled to be reroofed to that which can be safely accommodated by the existing deck. The loading will vary depending upon the deck type in each location.
- G. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.
 - 1. Remove only as much roofing in one day as can be made watertight in the same day.
- H. Hazardous Materials: Hazardous materials shall be removed by a licensed abatement contractor.
 - 1. Existing roof will be left no less watertight than before removal.
 - 2. If additional materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.
- I. Hazardous Materials:
 - 1. Hazardous material remediation is specified elsewhere in the Contract Documents.
 - 2. Do not disturb hazardous materials or items suspected of containing hazardous materials except according to procedures specified elsewhere in the Contract Documents.
 - 3. Coordinate reroofing preparation with hazardous material remediation to prevent water from entering existing roofing system or building.

PART 2 - PRODUCTS

2.1 TEMPORARY PROTECTION MATERIALS

- A. As required.

2.2 INFILL AND REPLACEMENT MATERIALS

- A. Use infill materials matching existing roofing system materials unless otherwise indicated.
- B. Wood deck is to match existing.
- C. Fasteners: Factory-coated steel fasteners with metal or plastic plates listed in FM Approvals' RoofNav, and acceptable to new roofing system manufacturer.

2.3 AUXILIARY REROOFING MATERIALS

- A. General: Use auxiliary reroofing preparation materials recommended by roofing system manufacturer for intended use and compatible with components of new roofing system.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protection of In-Place Conditions:
 - 1. Limit traffic and material storage to areas of existing roofing that have been protected.
 - 2. Maintain temporary protection and leave in place until replacement roofing has been completed. Remove temporary protection on completion of reroofing.
- B. Seal or isolate windows that may be exposed to airborne substances created in removal of existing materials.
- C. Shut off rooftop utilities and service piping before beginning the Work.
- D. Test existing roof drains to verify that they are not blocked or restricted.
 - 1. Immediately notify Architect of any blockages or restrictions.
- E. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work.
 - 1. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.
- F. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.
- G. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday.
 - 1. Prevent debris from entering or blocking roof drains and conductors.

- a. Use roof-drain plugs specifically designed for this purpose.
 - b. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.
2. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new roofing system, provide alternative drainage method to remove water and eliminate ponding.

3.2 ROOF TEAR-OFF

- A. Notify Owner each day of extent of roof tear-off proposed for that day.
- B. Lower removed roofing materials to ground and onto lower roof levels, using dust-tight chutes or other acceptable means of removing materials from roof areas. Uncontrolled descent is not permitted.
- C. Full Roof Tear-off: Remove existing roofing and other roofing system components down to the existing roof deck.
 1. Remove existing roofing membrane(s).
 2. Remove base flashings and counter flashings as required.
 3. Remove perimeter edge flashing and gravel stops.
 4. Remove copings.
 5. Remove expansion-joint covers.
 6. Remove flashings at pipes, curbs, mechanical equipment, and other penetrations.
 7. Remove roof drains as indicated.
 8. Remove wood blocking, curbs, and nailers.
 9. Remove existing fasteners from deck.

3.3 DECK PREPARATION

- A. Inspect deck after tear-off of roofing system.
- B. If broken or loose fasteners that secure deck panels to one another or to structure are observed, or if deck appears or feels inadequately attached, immediately notify A/E.
 1. Do not proceed with installation until directed by A/E.
- C. If deck surface is unsuitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Architect.
 1. Do not proceed with installation until directed by A/E
- D. Provide additional deck securement as indicated on Drawings and in other Specification Sections.

3.4 BASE FLASHING REMOVAL

- A. Remove existing base flashings.
 1. Clean substrates of contaminants, such as asphalt, sheet materials, dirt, and debris.

- B. Do not damage metal counterflashings that are to remain.
 - 1. Replace metal counterflashings damaged during removal with counterflashings of same metal, weight or thickness, and finish as existing.
- C. Inspect parapet sheathing, wood blocking, curbs, and nailers for deterioration and damage.
 - 1. If parapet sheathing, wood blocking, curbs, or nailers have deteriorated, immediately notify Architect.

3.5 FASTENER PULL-OUT TESTING

- A. Perform fastener pull-out tests according to SPRI FX-1, and submit test report to Architect before installing new roofing system.
 - 1. Obtain A/E's approval to proceed with specified fastening pattern.
 - a. A/E may furnish revised fastening pattern commensurate with pull-out test results.

3.6 DISPOSAL

- A. Collect demolished materials and place in containers.
 - 1. Promptly dispose of demolished materials.
 - 2. Do not allow demolished materials to accumulate on-site.
 - 3. Storage or sale of demolished items or materials on-site is not permitted.
- B. Transport and legally dispose of demolished materials off Owner's property.

END OF SECTION 070150.22

SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermal insulation.
 - a. Board or block insulation at foundation perimeter.
 - b. Batt or blanket insulation at exterior framed and furred walls.
 - c. Board or block insulation at masonry cavity walls.

1.2 RELATED REQUIREMENTS

- A. Insulation for Cavity Face of Masonry: Section 04 05 05, UNIT MASONRY.
- B. Insulation for Insulated Wall Panels: Section 07 40 00, ROOFING AND SIDING PANELS.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. ASTM International (ASTM):
 1. C552-15 - Cellular Glass Thermal Insulation.
 2. C553-13 - Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 3. C578-15 - Rigid, Cellular Polystyrene Thermal Insulation.
 4. C591-15 - Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
 5. C612-14 - Mineral Fiber Block and Board Thermal Insulation.
 6. C665-12 - Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 7. C954-15 - Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Base to Steel Studs From 0.033 (0.84 mm) inch to 0.112 inch (2.84 mm) in thickness.
 8. C1002-14 - Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 9. D312/D312M-15 - Asphalt Used in Roofing.
 10. E84-15a - Surface Burning Characteristics of Building Materials.
 11. F1667-15 - Driven Fasteners: Nails, Spikes, and Staples.

1.4 SUBMITTALS

- A. Submittal Drawings:

CONTRACT No. 22-523
DIVISION 7 – THERMAL AND MOISTURE PROTECTION

1. Show insulation type, thickness, and R-value for each location.
 - B. Manufacturer's Literature and Data:
 1. Description of each product.
 2. Adhesive indicating manufacturer recommendation for each application.
- 1.5 DELIVERY
- A. Deliver products in manufacturer's original sealed packaging.
 - B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, production run number, and manufacture date.
 - C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.
- 1.6 STORAGE AND HANDLING
- A. Store products indoors in dry, weathertight facility.
 - B. Protect products from damage during handling and construction operations.
 - C. Protect foam plastic insulation from UV exposure.
- 1.7 WARRANTY
- A. Construction Warranty: one year labor and material warranty

PART 2 - PRODUCTS

- 2.1 INSULATION - GENERAL
- A. Insulation Thickness:
 1. Provide thickness required by R-value shown on drawings.
 2. Provide thickness indicated when R-value is not shown on drawings.
 - B. Insulation Types:
 1. Provide one insulation type for each application.
 - C. Sustainable Construction Requirements:
- 2.2 THERMAL INSULATION
- A. Perimeter Insulation In Contact with Soil:
 1. Polystyrene Board: ASTM C578, Type IV, V, VI, VII, or IX.
 2. Cellular Glass Block: ASTM C552, Type I or IV.

CONTRACT No. 22-523
DIVISION 7 – THERMAL AND MOISTURE PROTECTION

B. Exterior Framing or Furring Insulation:

1. Mineral Fiber: ASTM C665, Type II, Class C, Category I where concealed by thermal barrier.
2. Mineral Fiber: ASTM C665, Type III, Class A at other locations.

C. Roof and Deck Insulation

1. Roof and Deck Insulation, General: Preformed roof insulation boards approved by roofing manufacturer.
2. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, faced with glass fiber reinforced cellulosic felt facers on both major surfaces of the core foam.
3. Tapered Roof Insulation System:
 - a. Fabricate of mineral fiberboard, polyisocyanurate, perlite board, or cellular glass. Use only one insulation material for tapered sections. Use only factory-tapered insulation.
 - b. Cut to provide high and low points with crickets and slopes as shown.
 - c. Minimum thickness of tapered sections; 38 mm (1-1/2 inch).
 - d. Minimum slope 1/48 (1/4 inch per 12 inches).

2.3 ACCESSORIES

A. Fasteners:

1. Staples or Nails: ASTM F1667, zinc-coated, size and type to suit application.
2. Screws: ASTM C954 or ASTM C1002, size and length to suit application with washer minimum 50 mm (2 inches) diameter.
3. Impaling Pins: Steel pins with head minimum 50 mm (2 inches) diameter.
 - a. Length: As required to extend beyond insulation and retain cap washer when washer is placed on pin.
 - b. Adhesive: Type recommended by manufacturer to suit application.

B. Insulation Adhesive:

1. Nonflammable type recommended by insulation manufacturer to suit application.

C. Tape:

1. Pressure sensitive adhesive on one face.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.
- C. Clean substrates. Remove contaminants capable of affecting subsequently installed product's performance.

3.2 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions and approved submittal drawings.
 - 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
- B. Install insulation with vapor barrier facing the heated side, unless indicated otherwise.
- C. Install board insulation with joints close and flush, in regular courses, and with end joints staggered.
- D. Install batt and blanket insulation with joints tight. Fill framing voids completely. Seal penetrations, terminations, facing joints, facing cuts, tears, and un-lapped joints with tape.
- E. Fit insulation tight against adjoining construction and penetrations, unless indicated otherwise.

3.3 THERMAL INSULATION

- A. Perimeter Insulation In Contact with Soil:
 - 1. Vertical insulation:
 - a. Fill joints of insulation with same material used for bonding.
 - b. Bond polystyrene board to surfaces with adhesive.
 - 2. Horizontal insulation under concrete floor slab:
 - a. Lay insulation boards and blocks horizontally on level, compacted and drained fill.
 - b. Extend insulation from foundation walls towards center of building minimum 600 mm (24 inches).
- B. Exterior Framing or Furring Insulation:
 - 1. General:
 - a. Open voids are not acceptable.
 - b. Pack insulation around door frames and windows, in building expansion joints, door soffits, and other voids.
 - c. Pack behind outlets, around pipes, ducts, and services encased in walls.
 - d. Hold insulation in place with pressure sensitive tape.

CONTRACT No. 22-523
DIVISION 7 – THERMAL AND MOISTURE PROTECTION

- e. Lap facing flanges together over framing for continuous surface. Seal penetrations through insulation and facings.
 - 2. Metal Studs:
 - a. Fasten insulation between metal studs, framing, and furring with pressure sensitive tape continuous along flanged edges.
 - 3. Wood Studs:
 - a. Fasten insulation between wood studs or framing with nails or staples through flanged edges on face of stud.
 - b. Space fastenings maximum 150 mm (six inches) apart.
 - 4. Roof Rafters and Floor Joists:
 - a. Friction fit insulation between framing to provide minimum 50 mm (2 inch) air space between insulation and roof sheathing and subfloor.
 - C. Roof Assemblies Above Conditioned Spaces:
 - 1. Use impaling pins for attach insulation to underside of horizontal surfaces. Space fastenings as required to hold insulation in place and prevent sagging.
 - a. Bond insulation with adhesive when separate vapor retarder is used.
 - D. Masonry Cavity Wall Insulation:
 - 1. Install insulation on exterior faces of concrete and masonry inner wythes of cavity walls.
 - 2. Bond polystyrene board to surfaces with adhesive.
 - 3. Bond polyurethane or polyisocyanurate board, and perlite board to surfaces with adhesive.
 - 4. Bond cellular glass insulation to surfaces with hot asphalt or adhesive cement.
 - 5. Fill insulation joints with same material used for bonding.
- 3.4 CLEANING
- A. Remove excess adhesive before adhesive sets.
- 3.5 PROTECTION
- A. Protect insulation from construction operations.
 - B. Repair damage.

END OF SECTION 07 21 00

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SECTION 07 31 13 - ASPHALT SHINGLES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the asphalt shingles as shown on the Drawings and specified herein, including, but not limited to, the following:
 - 1. Granule surfaced asphalt shingle roofing.
 - 2. Moisture-shedding underlayment, eaves, valley and ridge protection.
 - 3. Metal flashing and trim.

1.3 RELATED SECTIONS

- A. Rough Carpentry - Section 061000.
- B. Sheet Metal Flashing - Section 076200.

1.4 SUBMITTALS

- A. Product data for each type of product specified, including details of construction relative to materials, dimensions of individual components, profiles, textures, and colors.
- B. Samples for initial selection purposes in form of manufacturer's sample finishes showing full range of colors and profiles available.

1.5 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Provide products that are identical to those tested for Class A fire resistance according to UL 790 by Underwriters Laboratories or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspection organization.
 - 1. Fire Resistance Ratings: As indicated by reference to design designations in UL "Fire Resistance Directory."

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site in manufacturer's unopened bundles or containers with labels intact.
- B. Handle and store materials at site to prevent water damage, staining, or other physical damage. Store roll goods on end. Comply with manufacturer's recommendations for job site storage, handling and protection.

1.7 PROJECT CONDITIONS

- A. Weather Conditions: Proceed with work only when existing and forecasted weather conditions will permit work to be installed in compliance with manufacturer's recommendations and when substrate is completely dry.

1.8 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. Asphalt Shingles: 3% of total area, but not less than 200 sq. ft. in unbroken bundles.

1.9 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace asphalt shingles that fail within specified warranty period.

- 1. Failures include, but are not limited to, manufacturing defects.
- 2. Material Warranty Period: 50 years from date of Substantial Completion, prorated, with first 10 years nonprorated.
- 3. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds of up to 130 mph for 15 years from date of Substantial Completion.
- 4. Algae-Resistance Warranty Period: Asphalt shingles will not discolor for 15 years from date of Substantial Completion.
- 5. Workmanship Warranty Period: 25 years from date of Substantial Completion.

- B. Roofing Installer's Warranty: On warranty form at end of this Section, signed by Installer, in which Installer agrees to repair or replace components of asphalt-shingle roofing that fail in materials or workmanship within specified warranty period.

- 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide the following products:

- 1. CertainTeed Corp. "Landmark Pro," color: Max Def Weathered Wood.
- 2. CertainTeed Corp. "Carriage House," color: Colonial Slate.

- B. Laminated-Strip Asphalt Shingles: Laminated, glass-fiber reinforced, mineral-granule surfaced, self-sealing asphalt fiberglass strip shingles complying with ASTM D 3462. Provide shingles bearing UL 790 Class "A" external fire exposure label and UL 997 "Wind Resistant" label.

- C. Hip and Ridge Shingles: Manufacturer's standard factory precut units to match shingles.

CONTRACT No. 22-523
DIVISION 7 – THERMAL AND MOISTURE PROTECTION

- D. Provide selections made by Architect from manufacturer's full range of standard colors, textures, and patterns for asphalt shingles of type specified.

2.2 ACCESSORIES

- A. Felt Underlayment: No. 30; unperforated organic felt complying with ASTM D 226, Type I, 36" wide.
- B. Asphalt Roofing Cement: Non-asbestos fibrated asphalt cement complying with ASTM D 4586, Type II, designed for trowel application.
- C. Shingling Nails: Aluminum or hot dip galvanized steel, 10 or 12 gauge, sharp-pointed, conventional roofing nails with barbed shanks, minimum 3/8" diameter head, and of sufficient length to penetrate 3/4" into solid decking or to penetrate through plywood sheathing. Material of nails in contact with flashing shall match materials selected for flashing to prevent galvanic action.
- D. Sheet Metal Flashing: As specified in Section 076200.
- E. Self-Adhering Roof Underlayment: Minimum 40 mil thick, self-adhering, polymer modified bituminous sheet membrane, complying with ASTM D 1970. Provide primer when recommended by underlayment manufacturer. Provide "WinterGuard" made by CertainTeed Corporation or comparable product by GCP Applied Technologies or approved equal.
 - 1. Install underlayment 3'-0" around perimeter and at all eaves, valleys, low-pitch roofs, rake edges, confined rake edges, and where shown.
- F. Rigid Ridge Vent: Air Vent Inc., a CertainTeed Company; "ShingleVent II." Manufacturer's standard rigid section high-density polypropylene or other UV-stabilized plastic ridge vent with nonwoven geotextile filter strips and with external deflector baffles; for use under ridge shingles.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where asphalt shingles are to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected by the Contractor in a manner acceptable to the Architect.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application. Cover knot holes or other minor voids in substrate with sheet metal flashing secured with non-corrosive roofing nails.
- B. Coordinate installation with flashings and other adjoining work to ensure proper sequencing. Do not install roofing materials until all vent stacks and other penetrations through roofing have been installed and are securely fastened against movement.

3.3 INSTALLATION

- A. Comply with manufacturer's installation instructions and recommendations, but not less than recommended by "The NRCA Steep Roofing Manual."
- B. Nail Base Insulation: Install to comply with manufacturer's recommendations and to attain the specified roofing warranty.
- C. Felt Underlayment: Apply one ply of felt underlayment horizontally over entire surface to receive asphalt shingles, lapping courses a minimum of 2", end laps a minimum of 4", and hips a minimum of 6". Fasten felt with sufficient number of roofing nails or non-corrosive staples to hold underlayment in place until asphalt shingle application. Provide double layer of felt at roof slopes between 2:12 and 4:12.
- D. Waterproof Underlayment: Apply waterproof underlayment at eaves and as shown on drawings. Cover deck from eaves at least 36" inside exterior wall line.
- E. Install asphalt shingles beginning at lower end with a starter strip of roll roofing or inverted shingles with tabs removed. Fasten shingles in pattern, with weather exposure, and using number of fasteners per shingle as recommended by manufacturer. Use vertical and horizontal chalk lines or premarked underlayment to ensure straight coursing.
 - 1. Cut and fit asphalt shingles at ridges and edges to provide maximum weather protection. Provide same weather exposure at ridges as specified for roof. Lap shingles at ridges to shed water away from direction of prevailing wind. Fasteners at ridges shall be of sufficient length to penetrate sheathing as specified.
 - 2. Set shingle pattern as recommended by shingle manufacturer for shingle selected.
- F. Flashing: Install metal flashing in accordance with details and recommendations of the "Asphalt Roofing" section of "The NRCA Steep Roofing Manual."

3.4 ADJUSTING

- A. Replace any damaged materials installed under this Section with new materials meeting specified requirements.

END OF SECTION

SECTION 07 46 23 - WOOD SIDING ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood Siding
2. Drainable building wrap
3. Flexible flashing
4. Sheathing

B. Related Requirements:

1. Section 06 10 00 - Rough Carpentry.
2. Section 06 40 13 "Exterior Architectural Woodwork" for wood exterior-wall trim.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include data for fire-retardant treatment.

B. Samples: For each exposed product and for each color and finish specified, in sizes indicated.

1. Wood Siding: Full size unit.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For siding to include in maintenance manuals.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Wood Siding: **100 sq. ft. (9.3 sq. m)** of each type, color, and finish, in unbroken bundles.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Approved by CSSB.

B. Grading shall be established by published grading rules.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

CONTRACT No. 22-523
DIVISION 7 – THERMAL AND MOISTURE PROTECTION

1. Build mockups for siding including accessories.
 - a. Size: 48 inches (1200 mm) long by 48 inches (1200 mm) wide.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store siding in a dry, well-ventilated, weathertight location according to manufacturer's written instructions.
- B. Store rolls of building wrap used for weather-resistive barrier on end, on pallets or other raised surfaces. Do not double stack rolls.
 1. Protect unused building wrap from weather, sunlight, and moisture when left overnight or when work is not in progress.

1.7 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit siding installation and related work to be performed according to manufacturer's written instructions.
 1. Field-Finished Siding: Proceed with installation of siding only when existing and forecast weather conditions permit installation and the immediate application of at least one coat of specified finish on siding before it is exposed to rain, snow, or dampness.

PART 2 - PRODUCTS

2.1 WOOD SIDING

- A. Material: Yellow Southern Pine
- B. Pattern: 1 x 8 Tongue & Groove – Flush Joint
- C. Select Knotty - Smooth Face.

2.2 MEDIUM DENSITY OVERLAY BOARD (MDO)

- A. Material: smooth resin face bonded to plywood core
- B. Pattern: 3/4" thick by 4 x 8 (nominal)

CONTRACT No. 22-523
DIVISION 7 – THERMAL AND MOISTURE PROTECTION

- C. Smooth face

2.3 T1-11 PLYWOOD SHEATHING

- A. Material: pressure treated pine plywood
- B. Pattern: 3/4" thick by 4 x 8 (nominal), with parallel grooves
- C. Finish to match existing

2.4 PLYWOOD SHEATHING

- A. Material:
 - 1. Douglas fir plywood
 - 2. Fire-retardant douglas fir plywood
- B. Pattern: 3/4" thick by 4x8 (nominal)
- C. Basis of design:
 - 1. Menards Plywood Sheathing, Model #1231182
 - 2. Menards Fire Retardant Plywood Sheathing, Model #1235420
- D. Location: see drawings for locations of rated exterior walls requiring Fire Retardant Plywood Sheathing

2.5 PERFORMANCE REQUIREMENTS

- A. Grading Rules: Provide siding that complies with CSSB's grading rules for products indicated.
 - 1. Identification: Attach a label to each bundle of siding that identifies manufacturer, type of product, grade, dimensions, and identification mark of grading agency.

2.6 ACCESSORIES

- A. Weather Barrier: TamlynWrap® Drainable Wrap
 - 1. Thickness: 1.8mm polypropylene sheet, with 1.5mm drainage space
- B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable rubberized-asphalt compound bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin.
 - 1. Minimum Overall Thickness: 0.040 inch (1.0 mm).
 - 2. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for applicable substrate.
- C. Nails: ASTM F1667, stainless-steel, Type 316, wire nails, sharp pointed, and of sufficient length to penetrate a minimum of 3/4 inch (19 mm) into sheathing.
 - 1. Shingles: Use box or casing nails.

CONTRACT No. 22-523
DIVISION 7 – THERMAL AND MOISTURE PROTECTION

2. Shakes: Use box nails.
3. Felt Weather-Resistive Barrier: Use roofing nails.
4. Nails in Contact with Metal Flashing: Use nails made from same metal as flashing.

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. 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 DRAINABLE WEATHER-RESISTIVE BARRIER INSTALLATION

- A. General: Comply with manufacturer's written installation instructions and CSSB recommendations applicable to products and applications indicated unless more stringent requirements apply.
- B. Cover exposed exterior surface of sheathing with wrap nailed (cap-fasteners) to framing immediately after sheathing is installed.
 1. Apply horizontally with a 6-inch (51-mm) overlap and a 6-inch (152-mm) end lap. Wrap around inside and outside corners 12 inches (102 mm).
 2. Cut back wrap 1/2 inch (13 mm) on each side of the break in supporting members at expansion- or control-joint locations.
 3. Apply wrap to cover vertical flashing with a minimum 4-inch (102-mm) overlap unless otherwise indicated.

3.3 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing to comply with manufacturer's written instructions.
 1. Prime substrates as recommended by flashing manufacturer.
 2. Lap seams and junctures with other materials at least 4 inches (102 mm) except that at flashing flanges of other construction, laps need not exceed flange width.
 3. Lap flashing over felt weather-resistive barrier at bottom and sides of openings.
 4. Lap felt weather-resistive barrier over flashing at heads of openings.
 5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

3.4 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

- B. Products shall have all butt and scarf joints caulked with a quality, exterior rated, flexible caulk prior to paint application. All non-trim/fascia abutments shall be caulked and sealed with the same exterior grade caulk.
- C. Ends exposed due to post-manufacturing field cuts shall be sealed with a premium, 100% acrylic primer, to ensure that no fiber is left exposed to the elements.
- D. Align the groove with the tongue and slide the board in place. Joints shall fall over framing lumber and shall be double nailed. Do not nail any less than 1/2 inch (13 mm) from any edge and fasten at a minimum of every 24 inches (610 mm) on center.
- E. Drive nail fasteners at 45-degree angles through the tongue into the sheathing. Nails shall penetrate at least 1-1/4 inches (32 mm) into the structural framing.
- F. Prime and paint all sides and edges prior to installation to ensure against rot.

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 07 46 23

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SECTION 07 52 16 – STYRENE-BUTADIENE-STYRENE (SBS) MODIFIED BITUMINOUS
MEMBRANE ROOFING

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the modified bitumen roofing as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Preparation of substrate to receive roofing materials.
 - 2. Roof Insulation where indicated.
 - 3. Styrene-butadiene-styrene (SBS)-modified bituminous membrane roofing.
 - 4. Roof flashing application.
 - 5. Incorporation of sheet metal flashing components and roofing accessories into the roof system.
 - 6. Field quality control.

1.3 RELATED SECTIONS

- A. Carpentry - Section 062000, for wood blocking.
- B. Sheet Metal Flashing - Section 076200.
- C. Preparation for Re-roofing – Section 070150.22
- D. Roof drains - Division 22.

1.4 REFERENCE STANDARDS

- A. References in these specifications to standards, test methods, codes etc., are implied to mean the latest edition of each such standard adopted. The following is an abbreviated list of associations, institutions, and societies which may be used as references throughout these specifications.
 - 1. ASTM American Society for Testing and Materials, Philadelphia, PA
(215) 299-5585
 - 2. FM Factory Mutual Engineering and Research, Norwood, MA
(617) 762-4300
 - 3. ICBO International Conference of Building Officials, Whittier, CA
(562) 699-0541

CONTRACT 22-523
DIVISION 7 – THERMAL AND MOISTURE PROTECTION

4. NRCA National Roofing Contractors Association, Rosemont, IL
(847) 299-9070
5. OSHA Occupational Safety and Health Administration, Washington,
DC (202) 523-1452
6. SMACNA Sheet Metal and Air Conditioning Contractors National
Association, Chantilly, VA (703) 803-2980
7. UL Underwriters Laboratories, Northbrook, IL (708) 272-8800

1.5 DESCRIPTION OF WORK

- A. Scope of Work: The work to be performed under this specification shall include but is not limited to the following:
1. Attend necessary job meetings and furnish competent, full time, English-speaking supervision, experienced roof mechanics, all materials, tools, and equipment necessary to complete, in an acceptable manner, the roof installation in accordance with this specification. Comply with the latest written application instructions of the manufacturer of the primary roofing products. In addition, application practice shall comply with requirements and recommendations contained in the latest edition of the Handbook of Accepted Roofing Knowledge (HARK) as published by the National Roofing Contractor's Association, amended to include the acceptance of a phased roof system installation.
 2. The basic work descriptions (components, layering and attachment methods) required in this specification are referenced below. See also Parts 2 and 3 for specific products, preparation, application and details.
 - a. Project Type: Tear-off to existing deck
 - b. Deck: Wood plank.
 - c. Slope: Less than 1/2 inch.
 - d. Deck Preparation: Prime with PA-917LS primer.
 - e. Temporary Roof: Siplast Irex 40, torch applied.
 - f. Insulation (Bottom Layer): minimum 3.5 Polyisocyanurate, applied in Parastick adhesive.
 - g. Insulation (Top Layer): 1/4" Pre-Primed Glass Fiber Reinforced Gypsum Sheathing Recovery Panel, applied in Parastick adhesive.
 - h. Tapered Insulation: Tapered insulation boards shall provide slope to drain of minimum of 1/8" per foot.
 - i. Roof System: Siplast Paradiene 20TG, torch applied; Paradiene 30 FR TG BW, torch applied.
 - j. Fluid Applied Flashing: Siplast Parapro 123 catalyzed resin reinforced fluid applied flashing.
 - k. Specified Guarantee: Twenty Year Roof System Guarantee.
 - l. Siplast Specification: 2030 IT

1.6 SUBMITTALS

- A. All submittals which do not conform to the following requirements will be rejected.
1. Submittals Prior to Contract Award

CONTRACT 22-523
DIVISION 7 – THERMAL AND MOISTURE PROTECTION

- a. Letter from the proposed primary roofing manufacturer confirming that the bidder is an acceptable Contractor authorized to install the proposed system.
 - b. Letter from the primary roofing manufacturer stating that the proposed application will comply with the manufacturer's requirements in order to qualify the project for the specified guarantee.
2. Submittals Prior to Project Closeout: Manufacturer's printed recommendations for proper maintenance of the specified roof system including inspection frequencies, penetration addition policies, temporary repairs, and leak call procedures.
- B. Submit a letter signed by the manufacturer and Contractor acknowledging that the submitted roofing system complies with ASCE-7, for wind speed requirements based on height of structure and geographic location of project.
- C. Manufacturer's system description letter.
- D. Qualifications: For Contractor.
- E. Product Data: For each type of product.
- F. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:
1. Base flashings and membrane terminations.
 2. Tapered insulation layout drawings, including slopes.
 3. Crickets, saddles, and tapered edge strips, including slopes.
 4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

1.7 QUALITY ASSURANCE

- A. Source Limitations: Primary roofing products, including each type of sheet, all manufactured in the United States, shall be supplied by a single manufacturer which has been successfully producing the specified types of primary products for not less than 10 years. Secondary or accessory products shall be acceptable to the manufacturer of the primary roofing products.
- B. Agency Approvals: The proposed roof system shall conform to the following requirements. No other testing agency approvals will be accepted.
1. Underwriters Laboratories Class A acceptance of the proposed roofing system (including mopping asphalt or cold adhesive) without additional requirements for gravel or coatings.
- C. Installer Qualifications: Installer shall have a minimum of 2 years' experience in successfully installing the same or similar roofing materials and be approved, authorized, or licensed by the roofing system manufacturer to install the manufacturer's product and eligible to receive manufacturer's special warranty.
- D. Local Regulations: Conform to regulations of public agencies, including any specific requirements of the city and/or state of jurisdiction.
- E. Manufacturer Requirements: Ensure that the primary roofing materials manufacturer provides direct trained company personnel to attend necessary job meetings, perform periodic inspections as necessary, and conducts a final inspection upon successful.

1.8 PRODUCT DELIVERY STORAGE AND HANDLING

- A. Delivery: Deliver materials in the manufacturer's original sealed and labeled containers and in quantities required to allow continuity of application.
- B. Storage: Store materials out of direct exposure to the elements. Store roll goods on a clean, flat and dry surface. All material stored on the roof overnight shall be stored on pallets. Rolls of roofing must be stored on ends. Store materials on the roof in a manner so as to preclude overloading of deck and building structure. Store materials such as solvents, adhesives and asphalt cutback products away from open flames, sparks or excessive heat. Cover all material using a breathable cover such as a canvas. Polyethylene or other non-breathable plastic coverings are not acceptable.
- C. Handling: Handle all materials in such a manner as to preclude damage and contamination with moisture or foreign matter. Handle rolled goods to prevent damage to edges or ends.
- D. Damaged Materials: Any materials that are found to be damaged or stored in any manner other than stated above will be automatically rejected, removed and replaced at the Contractor's expense.

1.9 PROJECT/SITE CONDITIONS

A. Requirements Prior to Job Start

- 1. Notification: Give a minimum of 5 days notice to the Owner and manufacturer prior to commencing any work and notify both parties on a daily basis of any change in work schedule.
- 2. Permits: Obtain all permits required by local agencies and pay all fees which may be required for the performance of the work.
- 3. Safety: Familiarize every member of the application crew with all fire and safety regulations recommended by OSHA, NRCA and other industry or local governmental groups.

B. Environmental Requirements:

- 1. Precipitation: Do not apply roofing materials during precipitation or in the event there is a probability of precipitation during application. Take adequate precautions to ensure that materials, applied roofing, and building interiors are protected from possible moisture damage or contamination.
- 2. Temperature Restrictions: Cold Adhesive. At low temperatures, the specified cold adhesive becomes more viscous, making even distribution more difficult. Store cold adhesive in a warm place immediately prior to use. Use a shop squeegee to assist in an even distribution of the adhesive (cut notches out of the rubber blade of the squeegee). Suspend application in situations where the adhesive cannot be kept at temperatures allowing for even distribution.

C. Protection Requirements

- 1. Membrane Protection: Provide protection against staining and mechanical damage for newly applied roofing and adjacent surfaces throughout this project.

2. Torch Safety: Designate one person on each crew to perform a daily fire watch. The designated crew member shall watch for fires or smoldering materials on all areas of roof construction. Continue the fire watch for one hour after roofing material application has been suspended for the day.
3. Limited Access: Prevent access by the public to materials, tools and equipment during the course of the project.
4. Debris Removal: Remove all debris daily from the project site and take to a legal dumping area authorized to receive such materials.
5. Site Condition: Complete, to the owner's satisfaction, all job site clean-up including building interior, exterior and landscaping where affected by the construction.

1.10 GUARANTEE/WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.: Upon successful completion of the project, and after all post installation procedures have been completed, furnish the Owner with the Manufacturer's twenty (20) year labor and materials membrane guarantee. The guarantee shall be a term type, without deductibles or limitations on coverage amount (No Dollar Limit) and shall include insulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Siplast or approved equal by Soprema, Henry, Johns Manville.
- B. Obtain components including roof insulation, fasteners, cover board, and flashings for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing system and flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.
 1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
 2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746/D3746M, ASTM D4272/D4272M, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.
- C. Wind Uplift Resistance: Design roofing system to resist the following wind uplift pressures when tested according to FM Approvals 4474, UL 580, or UL 1897, complying with ASCE-7, for wind speed requirements based on height of structure and geographic location of project.

- D. Roof system shall have a minimum initial solar reflectance of 0.7 in accordance with ASTM C1549 or ASTM E1918 and minimum thermal emittance of 0.75 as determined in accordance with ASTM C1371 or ASTM E408 or a minimum SRI of 78 as determined in accordance with ASTM E1980.

2.3 ROOF INSULATION

- A. Polyisocyanurate Board Insulation: UL and/or FM approved closed cell, rigid polyisocyanurate foam core material, ASTM C 1289, Type II, Class 1, approved by the roofing manufacturer in writing for the intended use with the specified roof assembly
 - 1. Maintain a maximum panel size of 4 feet by 4 feet where insulation is specified to be installed in insulation adhesive.
 - 2. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.
 - 3. Provide insulation thicknesses and taper as indicated in the drawings.

2.4 INSULATION ACCESSORIES

- A. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer. The insulation fasteners shall provide attachment required to meet the specified uplift performance and to restrain the insulation panels against the potential for ridging, etc. Subject to compliance with requirements, products that may be incorporated into the Work include but are not limited to Siplast “Parafast” fasteners with metal plates.
- B. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer. Subject to compliance with requirements, products that may be incorporated into the Work include but are not limited to “Para-Stick Professional Roof Insulation Adhesive.”
- C. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/4 inch thick, factory primed. Subject to compliance with requirements, products that may be incorporated into the Work include but are not limited to Georgia Pacific, Dens-Dek. Prime.
- D. Temporary Roof Ply Sheet. A fiberglass reinforced specially oxidized asphalt coated sheet having a minimum weight of 70 lb./square. Type: Siplast Irex 40.

2.5 DESCRIPTION OF SYSTEM

- A. Roofing Membrane Assembly. A roof membrane assembly consisting of two plies of a prefabricated, fiberglass reinforced, homogeneous Styrene-Butadiene-Styrene (SBS) block copolymer modified asphalt membrane, secured to a prepared substrate. Both reinforcement mats shall be impregnated and coated each side with a high quality SBS modified bitumen blend. The assembly shall possess waterproofing capability, such that a phased roof application, with only the modified bitumen base ply in place, can be achieved for prolonged periods of time without detriment to the watertight integrity of the entire roof system.
 - 1. Siplast, Paradiene 20TG/30 FRTG roof system.

- B. Roofing Sheet Materials: Modified Bitumen Base Ply: ASTM D 6163, Grade S, Type I or II, SBS-modified asphalt sheet (reinforced with glass fibers); smooth surfaced; suitable for application method specified.
1. Thickness (avg.): 114 mils - 2.9 mm
 2. Weight (avg. per 100 ft² of coverage) - 80 lbs - 3.9 kg/m²
 3. Low temperature flexibility @ 13° F (-25° C) - PASS (ASTM D 5147)
 4. Breaking Load (avg.) @ 73° F - 30 lbf/inch (ASTM D 5147)
 5. Ultimate Elongation (avg.) @ 73° F - 50% (ASTM D 5147)
 6. Compound Stability (min.) - 248° F (120° C)
 7. Approvals - UL Class listed, FM Approved (products shall bear seals of approval)
 8. Reinforcement - fiberglass mat
 9. Subject to compliance with requirements, products that may be incorporated into the Work include Siplast Paradiene 20.
- C. Modified Bitumen Finish Ply: Granule-Surfaced Roofing Cap Sheet: ASTM D 6163, Grade G, Type I or II, SBS-modified asphalt sheet (reinforced with glass fibers); granule surfaced; suitable for application method specified, and as follows:
1. Thickness (avg.): 150 mils - 3.8 mm
 2. Thickness at selvage (avg.): 118 mils - 3.0 mm
 3. Weight (avg. per 100 ft² of coverage) - 110 lbs - 5.4 kg/m²
 4. Low temperature flexibility @ -13° F (-25° C) - PASS (ASTM D 5147)
 5. Breaking Load (avg.) @ 73° F - 30 lbf/inch (ASTM D 5147)
 6. Ultimate Elongation (avg.) @ 73° F - 55% (ASTM D 5147)
 7. Compound Stability (min.) - 248° F (120° C)
 8. Approvals - UL Class listed, FM Approved (products shall bear seals of approval)
 9. Reinforcement - fiberglass mat
 10. Surfacing – white acrylic chip
 11. Subject to compliance with requirements, products that may be incorporated into the Work include Siplast Paradiene 30 30 FR.
- D. Stripping Ply - (Same as roof system base ply unless noted)
- E. Reinforced Fluid Applied PMMA Flashing System: A multi-component, flexible, polymethylmethacrylate (PMMA) based resin combined with a thixotropic agent for use in combination with fleece fabric to form a monolithic, reinforced flashing membrane.
1. Subject to compliance with requirements, products that may be incorporated into the Work include but are not limited to Siplast Parapro 123 reinforced fluid applied flashing.
 2. Catalyst: A reactive agent used to induce curing of polymethylmethacrylate (PMMA) resins.
 3. Fleece for Membrane and Flashing Reinforcement: A non-woven, 110 g/m², needle-punched polyester fabric reinforcement as supplied by the membrane system manufacturer.
 4. Resin for Flashing Applications: A multi-component, flexible, polymethylmethacrylate (PMMA) based resin combined with a thixotropic agent for use in combination with fleece fabric to form a monolithic, reinforced flashing membrane.

2.6 AUXILIARY ROOFING MATERIALS

A. Roofing Adhesives

1. Insulation Adhesive. A single component, moisture cured, polyurethane foam adhesive, dispensed from a portable, pre-pressurized container used to adhere insulation panels to the substrate as well to other insulation panels. 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. Para-Stick Professional Roofing Adhesive by Siplast Engineered Roofing Systems. (800) 922-8800.

B. Bituminous Cutback Materials

1. Primer. A high flash, quick drying, asphalt solvent blend which meets or exceeds ASTM D 41 requirements. 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. Siplast, PA-917LS Asphalt Primer.
2. Mastics. An asphalt cutback mastic, reinforced with non-asbestos fibers, used as a base for setting metal flanges conforming to ASTM D 4586 Type II requirements. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Siplast PA-1021 Plastic Cement.

C. Caulking/Sealants. A single component, high performance, elastomeric sealant conforming to ASTM D 232, ASTM C 920, or ASTM C 920. Acceptable types are as follows: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Tremseal by TREMCO; Cleveland, OH (216) 292-5000
2. Sonolastic NP 1 by Sonneborn Building Products; Minneapolis, MN (612) 922-7090
3. Black Jack No. 1010 by Gibson-Homans; Twinsburg, OH (216) 425-3255

D. PMMA Primers

1. PMMA Primer for Concrete/Masonry/Wood/Plywood Substrates: A two component, PMMA based primer for use over concrete, concrete repair materials, masonry substrates and wood/plywood substrates.
 - > Pro Primer T by Siplast; Irving, TX
2. PMMA Primer for Asphaltic Substrates: A two component, fast-curing, PMMA based primer for use over asphaltic materials.
 - > Pro Primer R by Siplast; Irving, TX

- E. Preparation Paste: A multi-component, fast curing, PMMA based paste used for remediation of depressions in substrate surfaces or other irregularities.
 - > Pro Paste Resin by Siplast; Irving, TX
- F. Walktread. Reinforced asphaltic composition pads with slip-resisting mineral-granule surface, manufactured as a traffic pad for foot traffic and acceptable to roofing system manufacturer..
 - 1. Width: 30 in - (76.2 cm)
 - 2. Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to Siplast, Paratread Roof Protection Material.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with roofing system manufacturer's written instructions.
- B. Substrate-Joint Penetrations: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.2 PREPARATION

- A. General. Sweep or vacuum all surfaces, removing all loose aggregate and foreign substances prior to commencement of roofing.

3.3 SUBSTRATE PREPARATION

- A. Primer. Prime entire deck area with specified primer at a rate of 100 square feet per gallon.
- B. Temporary Roof Application. Apply the ply sheets directly to the prepared surface lapping sides and ends a minimum of three (3) inches. Apply the sheets free of wrinkles, creases or fishmouths and exert sufficient pressure on the roll during application to ensure the prevention of air pockets. Seal each penetration and termination using fiberglass tape and the specified plastic cement to ensure that the temporary roof configuration is completely water-tight.
- C. Insulation. Install insulation panels with end joints offset; edges of the panels shall be in moderate contact without forcing applied in strict accordance with the insulation manufacturer's requirements and the following instructions. Where insulation is installed in two or more layers, stagger joints between layers.
 - 1. Insulation - Multiple Layer. Install insulation panels in an application of the specified insulation adhesive in strict accordance with the requirements of the insulation adhesive manufacturer.

Insulation panels installed in adhesive shall have a maximum panel size of 4 feet by 4 feet.

3.4 ROOF MEMBRANE INSTALLATION

- A. Membrane Application. Apply roofing in accordance with roofing system manufacturer's instructions and the following requirements.

- B. Application of roofing membrane components shall immediately follow application of base sheet and/or insulation as a continuous operation. Coordinate installation of roofing system so insulation and other components of the roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast
- C. Aesthetic Considerations. An aesthetically pleasing overall appearance of the finished roof application is a standard requirement for this project. Make necessary preparations, utilize recommended application techniques, apply the specified materials (i.e. granules, metallic powder, etc.), and exercise care in ensuring that the finished application is acceptable to the Owner.
- D. Priming. Prime metal flanges (all jacks, edge metal, lead drain flashings, etc.) and concrete and masonry surfaces with a uniform coating of ASTM D 41 asphalt primer.
- E. Membrane Adhesive Application. Apply cold adhesive in a smooth, even, continuous layer without breaks or voids at the Manufacturer's recommended rate per square per ply. (The porosity of some substrates may require a heavier application to ensure full adhesion).
- F. Bitumen Consistency. Cutting or alterations of bitumen, primer, and sealants will not be permitted.
- G. Roofing Application. Apply all layers of roofing free of wrinkles, creases or fishmouths. Exert sufficient pressure on the roll during application to ensure prevention of air pockets. Stagger the lap seams between the base ply layer and the finish ply layer. Stagger the courses to ensure this.
1. Apply all layers of roofing perpendicular to the slope of the deck.
 2. Fully bond the base ply to the prepared substrate, utilizing minimum 3 inch side and end laps. Apply each sheet directly behind the torch/adhesive applicator. Stagger end laps a minimum of 3 feet.
 3. Fully bond the finish ply to the base ply, utilizing minimum 3 inch side and end laps. Apply each sheet directly behind the torch/adhesive applicator. Stagger end laps of the finish ply a minimum 3 feet. Stagger side laps of the finish ply a minimum 12 inches from side laps in the underlying base ply. Stagger end laps of the finish ply a minimum 3 feet from end laps in the underlying base ply.
 4. Maximum sheet lengths and special fastening of the specified roof membrane system may be required at various slope increments where the roof deck slope exceeds 1/2 inch per foot. The manufacturer shall provide acceptable sheet lengths and the required fastening schedule for all roofing sheet applications to applicable roof slopes.
- H. Granule Embedment. Broadcast mineral granules over all bitumen overruns on the finish ply surface, to ensure a monolithic surface color.
- I. Mixing Of Resin Products. Preparation/Mixing/Catalyzing Resin Products: Pour the desired quantity of resin into a clean container and using a spiral mixer or mixing paddle, stir the liquid for the time period specified by the resin manufacturer. Calculate the amount of catalyst powder needed using the manufacturers guidelines and add the pre-measured catalyst to the primer. Mix again for the time period specified by the resin manufacturer, ensuring that the product is free from swirls and bubbles. It is imperative that air is not entrained into the product during the mixing process. To avoid aeration, do not use a spiral mixer unless the spiral section

of the mixer can be fully contained in the liquid during the mixing process. Mix only enough product to ensure that it can be applied before expiration of resin pot life

J. Reinforced Fluid Applied PMMA Flashing Application

1. Using masking tape, mask the perimeter of the area to receive the flashing system. Apply resin primer to substrates requiring additional preparation and allow primer to set.
2. Pre-cut fleece to ensure a proper fit at transitions and corners prior to membrane application.
3. Apply an even, generous base coat of flashing resin using a roller at the rate of 19 kg/sq (2.0 kg/m²) to prepared surfaces requiring flashing coverage. Work the fleece into the wet, catalyzed resin using a brush or roller to fully embed the fleece in the resin and remove trapped air. Lap fleece layers a minimum of 2 inch (5 cm) and apply an additional coat of catalyzed resin between layers of overlapping fleece. Again using a roller, apply an even top coat of catalyzed resin at the rate of 12 kg/sq (1.3 kg/m²) immediately following embedment of the fleece, ensuring full saturation of the fleece. Ensure that the flashing resin is applied to extend a 0.25 inch (6 mm) beyond the fleece. Remove the tape before the catalyzed resin sets. Make allowances for saturation of roller covers and application equipment.
4. Should work be interrupted for more than 12 hours or the surface of the catalyzed resin becomes dirty or contaminated by the elements, wipe the surface to be lapped with new flashing resin using the specified cleaner/solvent. Allow the surface to dry for a minimum 20 minutes and a maximum 60 minutes before continuing work.

- K. Water Cut-Off. At end of day's work, or when precipitation is imminent, construct a water cut-off at all open edges. Cut-offs can be built using asphalt or plastic cement and roofing felts, constructed to withstand protracted periods of service. Cut-offs must be completely removed prior to the resumption of roofing.

3.5 ROOF SYSTEM INTERFACE WITH RELATED COMPONENTS

- A. The following is a list of verbal descriptions for correct installation of components integrated into the roof membrane assembly. In all cases, unless otherwise approved, incorporate flanged components into the system between the application of the base ply and the finish ply. The flange must be primed with a uniform coating of approved ASTM D 41 asphalt primer and allowed to dry thoroughly; all flanges must be set in approved mastic.
1. Edge Metal. Completely prime metal flanges and allow to dry prior to installation. Turn the base ply down 2 inches past the roof edge and over the nailer. After the base ply and continuous cleat (if applicable) have been installed, set the flange in mastic and stagger nail every 3 inches on center. Strip-in the flange using the stripping-ply material, extending a minimum of 4 inches beyond the edge of the flange. Terminate the finish ply at the gravel-stop rise of the edge metal. SEE ITEM: SEALANT, for finish of this detail.
 2. Lead Pipe Flashings. Completely prime the lead flanges and allow to dry prior to installation. After the base ply has been applied, set the flange in mastic and strip-in the flange using the stripping-ply material, extending a minimum of 4 inches beyond the edge of the flange. Terminate the finish ply at the flange-sleeve juncture of the pipe flashing. SEE ITEM: SEALANT for finish of this detail.

3. Lead Drain Flashings. Completely prime the lead drain flashing and allow to dry prior to installation. After the base ply has been applied, set the lead flashing sheet in mastic and form to turn down inside of the drain bowl. Ply-in the perimeter of the lead flashing using an additional layer of the base ply material, overlapping the perimeter of the lead a minimum of 4 inches. Terminate the finish ply to extend beneath the clamping ring seal. Install the clamping ring with all clamps, bolts etc., in place.
4. Metal Pipe Flashings. Completely prime the metal pipe flanges and allow to dry prior to installation. After the base ply has been applied, set the flanges in mastic and strip-in the flange using the stripping-ply material, extending a minimum of 4 inches beyond the edge of the flange. Terminate the finish ply at the flange-sleeve juncture of the pipe flashing. Install a watertight umbrella to the penetration, completely covering the opening of the pipe flashing. SEE ITEM: SEALANT for finish of this detail.
5. Walktread. Cut the walktread into maximum 5 foot lengths and allow to relax until flat. Adhere the sheet using the specified plastic cement. Apply the specified cement in a 3/8 inch thickness to the back of the product in 5 inch by 5 inch spots in accordance with the pattern as supplied by the walktread manufacturer. Apply the cement. Walk-in each sheet after application to ensure proper adhesion. Use a minimum spacing of 2 inches between sheets to allow for proper drainage.
6. Sealant. Caulk all exposed finish ply edges at gravel stops, waste stacks, pitch pans, vent stacks, etc., with a smooth continuous bead of approved sealant.

3.6 VERIFICATION

- A. Flood Test: Flood test each roofing area for leaks, according to recommendations in ASTM D 5957, after completing roofing and flashing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
- B. Flood to an average depth of 2-1/2 inches (65 mm) with a minimum depth of 1 inch (25 mm) and not exceeding a depth of 4 inches (100 mm). Maintain 2 inches (50 mm) of clearance from top of base flashing.
- C. Flood each area for 48 hours.
- D. After flood testing, repair leaks, repeat flood tests, and make further repairs until roofing and flashing installation are watertight.
- E. Repair or remove and replace components of roofing system where test results or inspections indicate that they do not comply with specified requirements.
- F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 FIELD QUALITY CONTROL AND INSPECTIONS

- A. Site Condition. Leave all areas around job site free of debris, roofing materials, equipment and related items after completion of job.
- B. Notification of Completion. Notify the manufacturer by means of manufacturer's printed Notification of Completion form of job completion in order to schedule a final inspection date.
- C. Final Inspection

CONTRACT 22-523
DIVISION 7 – THERMAL AND MOISTURE PROTECTION

1. Post-Installation Meeting. Hold a meeting at the completion of the project, attended by all parties that were present at the pre-job conference. A punch list of items required for completion shall be compiled by the Contractor and the manufacturer's representative. Complete, sign, and mail the punch list form to the manufacturer's headquarters.
 2. Drain Verification. At final inspection of all work, verify that all drains, scuppers, etc., are functioning properly. Ensure that roof drains have adequate strainers.
- D. Issuance Of The Guarantee. Complete all post installation procedures and meet the manufacturer's final endorsement for issuance of the specified guarantee.

END OF SECTION

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SECTION 07 62 00 – SHEET METAL FLASHING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the sheet metal flashing as indicated on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Stainless steel flashing.
 - 2. Copper flashing.
 - 3. Field fabricating (including bending, cutting, soldering, etc.), if required, of flashing.
 - 4. Separation of contacting surfaces of dissimilar metals.

1.3 RELATED SECTIONS

- A. Roofing - Division 7.

1.4 SUBMITTALS

- A. Shop Drawings: Submit, showing all materials, finishes, fastenings, joint details, fabrication, construction and relation to adjoining construction.
- B. Samples: Submit 12" x 12" samples of flashing materials and finishes.

1.5 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation, and to protect the installed work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary at no additional cost to the Owner.

1.6 WARRANTY

- A. The Contractor shall warrant that all Metal Flashing Work executed under this Section will be free from defects in materials and workmanship for a period of ten (10) years from date of acceptance of the Project, and he shall remedy any defects in the Metal Flashing Work.

PART 2 PRODUCTS

2.1 MATERIALS

A. Stainless Steel Flashing Materials

1. Stainless Steel Flashing: ASTM A 240, Type 304, stainless steel, with 2D finish, dead soft temper, fully annealed, as manufactured by International Nickel Co., Republic Steel Corp., United States Steel, or Washington Steel Corp. Thickness of stainless steel shall be as listed below.
 - a. Concealed Flashings: 0.012" thick, thirty (30) gauge (U.S. Standard).
 - b. Exposed Flashings: 0.015" thick, twenty-eight (28) gauge (U.S. Standard).
 - c. Edge Strips: 0.025" thick, twenty-four (24) gauge (U.S. Standard).
2. Through-wall flashing shall have sawtooth ribs at three (3) inch intervals, as manufactured by Keystone Flashing Co., or approved equal.
3. Accessories and Fastenings: AISI, Types 302 and 304 stainless steel.
4. Solder: Composed of sixty (60) percent block tin and forty (40) percent pig lead, except that solder at seams exposed to public view shall be eighty (80) percent tin and twenty (20) percent lead.
5. Flux: An acid type flux manufactured specifically for soldering stainless steel, as approved.

B. Copper Materials

1. Sheet copper for all work of this Section shall conform to ASTM B 370, cold-rolled copper sheet, H00 or H01 temper, 20 oz. weight for exposed flashing, 10 oz. weight for concealed flashing.
2. Nails and fasteners, including rivets, screws and bolts, shall be of hard copper, brass or bronze.
 - a. Nails for nailing to wood and concrete shall be flathead, barbed, wire slating nails, not less than No. 12 ga., 1" long.
 - b. Screws and bolts shall have round heads.
 - c. Expansion shields shall be lead sleeves.
 - d. All anchors shall be installed through slotted holes in sheet metal components to minimize deformations of sheet metal components due to temperature variations.
3. Solder: ASTM B 32, Grade Sn50 composition 50% tin and 50% lead.
4. Flux: Rosin, muriatic acid neutralized with zinc or an approved brand of soldering paste.

- C. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type non-corrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where sheet metal flashing is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 METAL FLASHING INSTALLATION

- A. Reference Standard: Conform to the requirements of 5th Edition of the Sheet Metal and Air Conditioning Contractors Association (SMACNA) Architectural Sheet Metal Manual and with CDA's "Copper in Architecture Handbook."
- B. General: Fabricate and install metal flashing work in accordance with details and specifications of above Reference Standard, with manufacturer's instructions, and as herein specified, to provide a watertight installation. Apply metal flashing to smooth, even, sound, clean, dry surfaces free from defects. Make provisions to allow for expansion and contraction of metal flashing work. Wherever practicable, shop form all metal flashing work and deliver ready for installation. Form metal flashing work accurately to required profiles, with flat surfaces, straight edges and corners, free from defects. Fold exposed metal edges back not less than 1/2" and form drip.
- C. Nailing: Confine to sheets twelve (12) inches or less in width. Confine nailing to one edge only, locate nails where concealed. Use No. 12 x 1" long flat headed, annular threaded, Type 302 stainless steel nails for nailing to wood blocking; use one (1) inch long masonry nails for nailing to concrete. Space nails four (4) inches o.c. maximum.
- D. Cleating: Use cleats where sheets are more than twelve (12) inches in width. Space cleats approximately twelve (12) inches o.c. Cleats two (2) inches wide by three (3) inches long, of the same material and weight as the metal flashing being installed. Secure one end of the cleat with two (2) nails and fold edge back over the nail heads. Lock other end into seam or into folded edge of metal flashing sheets. Pre-tin cleats for soldered seams.
- E. Joining: Join metal flashings with one (1) inch locked and soldered seams except at slip joints. Mallet seams flat and solder full length of seam as specified below.
- F. Soldering
 - 1. Stainless Steel: Mechanically clean all metal surfaces to be soldered with steel wool. Clean and pre-tin edges of metal flashing to be soldered before soldering is begun with solder on both sides for a width of not less than 1-1/2". Solder slowly with well heated metal surfaces. Use ample solder. Show not less than one full inch of evenly flowed solder on seam. Seams shall have a liberal amount of flux brushed in before soldering is commenced. Where soldering paste or killed acid is employed as a flux, soldering shall follow immediately after application of the flux. Upon completion of soldering, clean surfaces of all flux.
 - 2. Copper: Tin uncoated copper surfaces at edges of sheets using solder recommended for copper work. Solder slowly with well-heated metal surfaces. Use ample solder. Show not less than one full inch of evenly flowed solder on seam. Seams shall have a liberal amount

of flux brushed in before soldering is commenced. Where soldering paste or killed acid is employed as a flux, soldering shall follow immediately after application of the flux. Upon completion of soldering, clean surfaces of all flux.

- G. Slip Joints: Locate slip joints not more than twenty-four (24) feet apart and not more than eight (8) feet from corners. Form slip joints as three (3) inch wide joints with cover piece behind flashing and fill locked ends neatly with sealant.
- H. Cap Flashing: Install over base flashings, in eight (8) to ten (10) foot lengths, lapped six (6) inches at ends. Cap flashing shall be increased longitudinally to produce spring action to hold bottom edge of cap flashing firmly against base flashing. Cap flashing shall lap base flashing at least four (4) inches, with exposed bottom edge at a forty-five (45) degree angle downward and folded back on underside at least 1/2" to form drip. Make cap flashing continuous at corners and angles.
- I. Miscellaneous Flashing: Provide all other miscellaneous metal flashing not specifically mentioned herein but indicated on drawings and/or required to provide a watertight installation.
- J. Separation of Dissimilar Materials: Back paint surfaces of metal flashing in contact with dissimilar metals or with concrete or masonry with bituminous paint.

END OF SECTION

SECTION 07 71 00 - ROOF SPECIALTIES AND ACCESSORIES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the roof specialties and accessories as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:
 - 1. Aluminum gutters and downspouts.

1.3 RELATED SECTIONS

- A. Roofing - Division 7.
- B. Sheet Metal Flashing - Section 076200.

1.4 SUBMITTALS

- A. Before any roof specialties and accessories are delivered to the job site, submit shop drawings showing profiles, joints, expansion control, accessories and anchoring devices.
- B. Samples for Verification:
 - 1. Include Samples of each type of roof specialty and accessory to verify finish and color selection, in manufacturer's standard sizes.
 - 2. Include roof-edge drainage systems made from 12-inch lengths of full-size components in specified material, and including fasteners, cover joints, accessories, and attachments.
- C. Submit written verification that gutter and downspout design is acceptable to roofing system and cladding system manufacturers.

1.5 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation, and to protect the installed work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2 PRODUCTS

2.1 ALUMINUM GUTTERS AND DOWNSPOUTS

- A. Provide half round aluminum gutters and downspouts fabricated of formed aluminum, 0.050" thick, alloy 5005-H154, smooth, no pattern.
- B. Gutters shall be manufactured in 10'-0" lengths, tapered and notched to provide a 1" telescoping lap joint and manufacturer's standard cover plate. Gutters shall be pre-punched at 12" o.c. to provide for thermal movement after installation.
 - 1. Provide manufacturer's standard support brackets and interior straps for installation at 24" o.c. Brackets shall be of a compatible material to gutter, with matching finish and color.
 - 2. Provide wire ball strainer at all downspout connections.
- C. Downspout shall be manufactured in 10'-0" lengths, rectangular closed-face with mitered elbows, factory offset on one end to provide for a 3/4" telescope joint. Downspout shall contain a factory mounted back, non-sealed to allow seepage of water in overflow conditions.
 - 1. Elbows for downspouts shall be of welded construction, with matching finish applied after welding. Such finish shall be of quality equal to finish for non-welded parts. Grinding and spray painting of parts to match will not be permitted. Elbows shall be provided with a factory offset on its lower end to allow a 3/4" telescope joint.
 - 2. Provide manufacturer's standard wall brackets of compatible material to downspout with matching finish and color.
 - 3. Provide concrete splash blocks where indicated.
- D. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: Cleaned with inhibited chemicals; Chemical Finish: Acid-chromate-fluoride-phosphate conversion coating; Organic Coating: As specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.
 - 1. Fluoropolymer Two-Coat System: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.
 - 2. Custom color and gloss as selected by the Architect.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where roof specialties and accessories are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

- A. General: Comply with manufacturer's instructions and recommendations. Coordinate with installation of roof deck and other substrates to receive accessory units, and with roof insulation, roofing and flashing; as required to ensure that each element of the work performs properly, and that combined elements are waterproof and weathertight. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.
- B. Isolation: Where metal surfaces of units are to be installed in contact with incompatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation.
- C. Cap Flashing: Where cap flashing is required as component of accessory, install to provide adequate waterproof overlap with roofing or roof flashing (as counter flashing). Seal with thick bead of mastic sealant, except where overlap is indicated to be left open for ventilation.
- D. Gutters
 - 1. Gutter Support Installation: Locate low and high points of gutter installation and chalk a guide line to allow a maximum 1/4"/40'-0" slope. Install continuous aluminum receiver as detailed on the drawings, aligned with the chalk or other type of guide line. Attach gutter support with non-corrosive screw anchors.
 - 2. Gutter Installation: Anchor and loosely lock back edge of gutter to continuous edge support. Insert each telescoping section into previous section for a distance of 1". Provide sealants and fasteners as recommended by manufacturer. Attach rear upper portion of gutter through pre-punched elongated holes at 12" o.c.
 - 3. Inside Strap Installation: Install straps spaced not more than 30" o.c. apart and loosely lock to front gutter bead. Strap shall be hooked into leading edge (bead) of gutter and riveted at its rear side. In no case shall strap be nailed, screwed, or otherwise fastened which would restrain thermal movement of product.
 - 4. Expansion Joints: At 40'-0" intervals, or as shown on plans, install manufacturer's standard elastomeric expansion joint assembly.
 - 5. Miter Corners: Install manufacturer's welded miter units at locations shown on plans. Corners shall have 30" legs, pre-punched, notched, and telescoping to match gutter. All units shall be finished after fabrication; grinding and touch-up painting will not be allowed.
 - 6. End/Caps Terminations: Install manufacturer's end caps at all end terminations. End caps shall be riveted at 2" o.c. and sealed.
 - 7. Outlets: Locate all outlet locations and field cut hole in a neat workmanlike manner. Hole shall be located a distance of 1" from backside of gutter. Insert manufacturer's stainless steel outlet, fasten in place with 4 rivets (one being located on each flange), and seal.

CONTRACT No. 22-523
DIVISION 7 – THERMAL AND MOISTURE PROTECTION

E. Downspouts

1. Install downspouts with brackets 24" o.c.; attach brackets to structure, use non-corrosive screw anchors.
2. Join sections with manufacturer's standard telescoping joints. Provide fasteners designed to hold downspouts securely 1" away from walls, locate fasteners at top and bottom and at approximately 60" o.c. in between. Provide elbows at base of downspout to direct water away from building.

3.3 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces in accordance with manufacturer's instructions. Touch up damaged metal coatings.

END OF SECTION

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Penetrations in fire-resistance-rated walls.
 - 2. Penetrations in horizontal assemblies.
 - 3. Penetrations in smoke barriers.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Playland Park, RYE, New York.

1.3 ACTION SUBMITTALS

- A. Product data.
- B. Sustainable Design Submittals: N/A
- C. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.
 - 1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly developed in accordance with current International Firestop Council (IFC) guidelines. Obtain approval of authorities having jurisdiction prior to submittal.

1.4 INFORMATIONAL SUBMITTALS

- A. Listed system designs.

1.5 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Approvals according to FM Approvals 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

PART 2 - PRODUCTS

- A. Acceptable Manufacturer: 3M Fire Protection Products, which is located at: 3M Center Bldg. 223-2N-21; St. Paul, MN 55144-1000, Toll Free Tel: 800-328-1687; Email request info (firetech1@mmm.com); Website: www.3m.com/firestop
- B. Requests for substitutions will be considered.
- C. Single Source: To maintain control and integrity of the fire-resistive applications a single manufacturer should be used. Specific UL or approved listing agencies systems applicable to each type of fire-resistive condition should be supplied by one manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestop systems installed with products bearing the classification marking of a qualified product certification agency in accordance with listed system designs published by a qualified testing agency.
 - 1) UL in its online directory "Product iQ."
 - 2) Intertek Group in its "Directory of Building Products."
 - 3) FM Approvals in its "Approval Guide."

2.3 PENETRATION FIRESTOPPING SYSTEMS

- A. Description: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems are to be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479.
 - 1. F-Rating: Not less than the fire-resistance rating of the wall penetrated.
 - 2. Membrane Penetrations: Install recessed fixtures such that the required fire resistance will not be reduced.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479.
 - 1. F-Rating: At least one hour, but not less than the fire-resistance rating of the floor penetrated.
 - 2. T-Rating: At least one hour, but not less than the fire-resistance rating of the floor. The following floor penetrations do not require a T-rating:

CONTRACT No. 22-523
DIVISION 7 – THERMAL AND MOISTURE PROTECTION

- a. Those within the cavity of a wall.
 - b. Floor, tub, or shower drains within a concealed space.
 - c. 4-inch (200-mm) or smaller metal conduit penetrating directly into metal-enclosed electrical switchgear.
3. W-Rating: Provide penetration firestopping systems with a Class 1 W-rating in accordance with UL 1479.
- D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479.
1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening and no more than 50-cfm (0.024-cu. m/s) cumulative total for any 100 sq. ft. (9.3 sq. m) at both ambient and elevated temperatures.
- E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.
- F. 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 system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

PART 3 - EXECUTION

3.1 INSTALLATION OF PENETRATION FIRESTOPPING SYSTEMS

- 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. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- C. 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.
1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- D. Install fill materials by proven techniques to produce the following results:
1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
 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.

3.2 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches (76 mm) high and with minimum 0.375-inch (9.5-mm) strokes.
 - 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet (4.57 m) from end of wall and at intervals not exceeding 30 feet (9.14 m).
- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing and inspecting agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.3 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

END OF SECTION 078413

SECTION 078443 - JOINT FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Joints in or between fire-resistance-rated constructions.
 2. Joints at exterior curtain-wall/floor intersections.
 3. Joints in smoke barriers.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Playland Park, RYE, New York.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals: N/A
- C. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.
1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly developed in accordance with current International Firestop Council (IFC) guidelines.

1.4 INFORMATIONAL SUBMITTALS

- A. Listed System Designs: For each joint firestopping system, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Approvals according to FM Approvals 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

PART 2 - PRODUCTS

- A. Acceptable Manufacturer: 3M Fire Protection Products, which is located at: 3M Center Bldg. 223-2N-21; St. Paul, MN 55144-1000, Toll Free Tel: 800-328-1687; Email request info (firetech1@mmm.com); Website: www.3m.com/firestop
- B. Requests for substitutions will be considered.
- C. Single Source: To maintain control and integrity of the fire-resistive applications a single manufacturer should be used. Specific UL or approved listing agencies systems applicable to each type of fire-resistive condition should be supplied by one manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Joint firestop systems installed with products bearing the classification marking of a qualified product certification agency in accordance with Listed System Designs published by a qualified testing agency.
 - 1) UL in its online directory "Product iQ."
 - 2) Intertek Group in its "Directory of Building Products."

2.3 JOINT FIRESTOPPING SYSTEMS

- A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems must accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
1. Provide products that, upon curing, do not re-emulsify, dissolve, leach, breakdown, or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture.
 2. Provide firestop products that do not contain ethylene glycol.
- B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E1966 or UL 2079.

CONTRACT No. 22-523
DIVISION 7 – THERMAL AND MOISTURE PROTECTION

1. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.
- C. Joints at Exterior Curtain-Wall/Floor Intersections: Provide joint firestopping systems with rating determined per ASTM E2307.
 1. F-Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.
- D. Joints in Smoke Barriers: Provide joint firestopping systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg (74.7 Pa).
 1. L-Rating: Not exceeding 5.0 cfm/ft. (0.00775 cu. m/s x m) of joint at both ambient and elevated temperatures.
- E. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.

2.4 ACCESSORIES

- A. Provide components of joint firestopping systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.
- B. General: Install joint firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- C. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.
- D. Install elastomeric fill materials for joint firestopping systems by proven techniques to produce the following results:
 1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
 2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
 3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.2 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches (76 mm) high and with minimum 0.375-inch (9.5-mm) strokes.
 - 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 ft. (4.57 m) from end of wall and at intervals not exceeding 30 ft. (9.14 m).
- B. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.3 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2393.
- B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.
- C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

END OF SECTION 078443

SECTION 07 92 00 - JOINT SEALANTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Contractor shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and install caulking and sealants.
 2. Extent of each type of caulking and sealant is shown or indicated and includes the following:
 - a. Interior and exterior joints in equipment and construction systems not filled by another material, and that are not required to be open for operation.
 - b. Exposed-to-view joints of all fire-rated sealants.
 - c. Joints specified to be re-caulked.
- B. Coordination:
1. Review installation procedures under other Sections and coordinate installation of items to be installed with or before caulking and sealants.
 2. Notify other trades in advance of installation of caulking and sealants to provide other trades with sufficient time for installing their work that must be installed before caulking and sealants.
 3. Coordinate final selection of caulking and sealants so that materials are compatible with all caulking and sealant substrates specified.

1.2 REFERENCES

- A. American Society of Testing Material (ASTM) Publications:
1. ASTM C510, Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants.
 2. ASTM C661, Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer.
 3. ASTM C793, Test Method for Effects of Accelerated Weathering on Elastomeric Joint Sealants.
 4. ASTM C794, Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
 5. ASTM C920, Specification for Elastomeric Joint Sealants.
 6. ASTM C1021, Practice for Laboratories Engaged in Testing Building Sealants.
 7. ASTM C1087, Test method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
 8. ASTM C1193, Guide for Use of Joint Sealants.
 9. ASTM C1247, Practice for Durability of Sealants Exposed to Continuous Immersion in Liquids.
- B. Federal Specifications (FS).
1. FS TT-S-00227, Sealing Compound: Elastomeric Type, Multi-component (for

CONTRACT No. 22-523
DIVISION 7 – THERMAL AND MOISTURE PROTECTION

2. Caulking, Sealing, and Glazing in Buildings and Other Structures).
FS TT-S-00230 Sealing Compound: Elastomeric Type, Single Component (for Caulking, Sealing, and Glazing in Buildings and Other Structures).
- C. South Coast Air Quality Management District's (SCAQMD).
 1. SCAQMD Rule 1168.

1.3 SUBMITTALS

- A. Action Submittals: Submit the following:
 1. Shop Drawings:
 - a. Schedule of caulking and sealants installation, indication each specific surface where caulking or sealants are to be provided and the material proposed for each application.
 2. Product Data:
 - a. Copies of manufacturer's data sheets including color charts, specifications, recommendations, and installation instructions for each type of sealant, caulking compound, and associated miscellaneous material required. Include manufacturer's published data, indicating that each product complies with the Contract Documents and is intended for the applications shown or indicated.
 - b. Product test reports and UL Listed design data sheets.
- B. Informational Submittals: Submit the following:
 1. Certificates:
 - a. Certify that materials are suitable for intended use and materials meet or exceed requirements of the Contract Documents.
 - b. Certification from manufacturer that products furnished are appropriate for surfaces and conditions to which they will be applied.
 - c. Certify that applicator is approved by manufacturer.
 2. Field Quality Control Submittals:
 - a. Results of tests on job mock-ups.
 - b. Pre-construction and post-construction field test reports.
 - c. Compatibility and adhesion test reports.
 - d. Contractor's Field Test Report Logs:
 - 1) Indicate time present at the Site.
 - 2) Include observations and results of field tests, and document compliance with manufacturer's installation instructions and supplemental instructions provided to installers.
 3. Pre-installation conference record.
 4. Qualifications: Submit qualifications for:
 - a. Installer.
 - b. Testing laboratory
- C. Closeout Submittals: Submit the following:
 1. Operation and Maintenance Data:
 - a. Recommended inspection intervals.

- b. Instructions for repairing and replacing failed sealant joints.
2. Warranty: Submit written warranties as specified in this Section.

1.4 QUALITY ASSURANCE

- A. Qualifications:
 1. Installer:
 - a. Engage a single installer, approved by product manufacturer, regularly engaged in caulking and sealant installation and with successful experience in applying types of products required, and who employs only tradesmen with specific skill and successful experience in the type of Work required.
 2. Testing Laboratory:
 - a. Furnish services of independent testing laboratory qualified according to ASTM C1021, for conducting testing required.
- B. Component Supply and Compatibility:
 1. Obtain materials only from manufacturers who will, if required:
 - a. Furnish at the Site services of a qualified technical representative to advise installer of proper procedures and precautions for using materials.
 - b. Test caulking and sealants for compatibility with substrates for conformance with FS-TT-S-00227, and recommend remedial procedures as required.
 2. Before purchasing each sealant, investigate its compatibility with joint surfaces, joint fillers, and other materials in joint system. Provide products that are fully compatible with actual installation condition, verified by manufacturer's published data or certification, and as shown on approved Shop Drawings and other approved submittals.
- C. Product Testing: Provide test results of laboratory pre-construction compatibility and adhesion testing, as specified in Article 3.1 of this Section, by qualified testing laboratory, based on testing of current sealant formulations within a 36-month period preceding the Notice to Proceed for the Work.
 1. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C920 and, where applicable, to other standard test methods.
 2. Test other joint sealants for compliance using specified post-construction field adhesion test.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Comply with the following:
 1. Delivery of Products:
 - a. Deliver products in caulking and sealant manufacturer's original unopened, undamaged containers, indicating compliance with approved Shop Drawings and approved Sample color selections.
 - b. Include the following information on label:
 - 1) Name of material and Supplier.

- 2) Formula or Specification Section number, lot number, color and date of manufacture.
 - 3) Mixing instructions, shelf life, and curing time, when applicable.
2. Storage of Products:
 - a. Do not store or expose materials to temperature above 90 degrees F or store in direct sunlight.
 - b. Do not use materials that are outdated as indicated by shelf life.
 - c. Store sealant tape in manner that will not deform tape.
 - d. In cool or cold weather, store containers for sixteen hours before using in temperature of approximately 75 degrees F.
 - e. When high temperatures prevail, store mixed sealants in a cool place.
 3. Handling:
 - a. Do not open containers or mix components until necessary preparatory Work and priming are complete.

1.6 JOB CONDITIONS

- A. Conform to applicable OSHA and the New York State Building Codes.
- B. Environmental Conditions:
 1. Do not install caulking and sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation.
 2. Proceed with the Work when forecasted weather conditions are favorable for proper cure and development of high-early bond strength.
 3. Where joint width is affected by ambient temperature variations, install elastomeric sealants when temperatures are in the lower third of manufacturer's recommended installation temperature range, so that sealant will not be subjected to excessive elongation and bond stress at subsequent low temperatures.
 4. When high temperatures prevail, avoid mixing sealants in direct sunlight.
 5. Supplemental heat sources required to maintain both ambient and surface temperatures within the range recommended by manufacturer for material applications are not available at the Site.
 6. Provide supplemental heat and energy sources, power, equipment, and operating, maintenance, and temperature monitoring personnel.
 7. Do not use heat sources that emit carbon dioxide or carbon monoxide into areas of caulking, sealants, and painting Work, and areas where Owner's personnel or construction personnel may work. Properly locate and vent such heat sources to outdoors so that caulking and sealants and other Work are unaffected by exhaust.

1.7 WARRANTY

- A. Provide written warranty, signed by manufacturer and Contractor, agreeing to repair or replace sealants that fail to perform as air-tight and watertight joints; or fail in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, or general durability; or appear to deteriorate in any

other manner not clearly specified in approved Shop Drawings and other submittals, as an inherent quality of material for exposure indicated.

1. Provide manufacturer warranty for period of one year from date of Substantial Completion of caulking and sealants Work.
2. Provide installer warranty for period of two years from date of Substantial Completion of caulking and sealants Work.

PART 2 PRODUCTS

2.1 SYSTEM PERFORMANCE

- A. Provide elastomeric joint sealants for interior and exterior joint applications that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. VOC Performance Criteria:
 1. VOC content of sealants used shall comply with current VOC content limits of SCAQMD Rule 1168. Sealants used as fillers shall comply with or exceed requirements of BAAQMD Regulation 8, Rule 51.
 - a. Sealants: 250 g/L.
 - b. Sealant Primers for Nonporous Substrates: 250 g/L.
 - c. Sealant Primers for Porous Substrates: 775 g/L.
- C. Provide colors selected by Engineer from caulking and sealant manufacturer's standard and custom color charts. "Or equal" manufacturers shall provide same generic products and colors as available from manufacturers specified.

2.2 MATERIALS

- A. Exterior and Interior Vertical Joints; Non-submerged:
 1. Two-component Polyurethane Sealant:
 - a. Products and Manufacturers: Provide one of the following:
 - 1) Sikaflex- 2c NS by Sika Corporation.
 - 2) Dymeric 240 FC by Tremco Sealant/Waterproofing Division of RPM International, Inc.
 - 3) Or equal.
 - b. Polyurethane based, two-component elastomeric sealant complying with:
 - 1) FS TT-S-00227E: Type II (non-sag) Class A and ASTM C920, Type M, Grade NS, Class 25.
 - 2) Adhesion-in-Peel, FS TT-S-00227E and ASTM C794: (Minimum five pounds per linear inch with no adhesion failure): 10 pounds.
 - 3) Hardness (Standard Conditions), ASTM C661: 25 to 35 (Shore A).
 - 4) Stain and color change, FS TT-S-00227E and ASTM C510: No discoloration or stain.
 - 5) Accelerated Aging, ASTM C793: No change in sealant

CONTRACT No. 22-523
DIVISION 7 – THERMAL AND MOISTURE PROTECTION

- 6) characteristics after 250 hours in weatherometer.
 - 6) Rheological Vertical Displacement at 120 degrees F, FS TT-S-00227E: No sag.
 - 7) VOC Content: 100 g/L, maximum.
- B. Exterior and Interior Horizontal Joints; Non-submerged:
- 1. Two-component Polyurethane Sealant:
 - a. Products and Manufacturers: Provide one of the following:
 - 1) Sikaflex- 2c SL by Sika Corporation.
 - 2) THC/900 by Tremco Sealant/Waterproofing Division of RPM International, Inc.
 - 3) Or equal.
 - b. Polyurethane based, two-component elastomeric, self-leveling sealant complying with the following:
 - 1) FS TT-S-00227E, Type I (self-leveling) Class A. and ASTM C920, Type M, Grade P, Class 25
 - 2) Water Immersion Bond, FS TT-S-00227E: Elongation of 50 percent with no adhesive failure.
 - 3) Hardness (Standard Conditions), ASTM C661: 35 to 45.
 - 4) Stain and Color Change, FS TT-S-00227E and ASTM C510: No discoloration or stain.
 - 5) Accelerated Aging, ASTM C793: No change in sealant characteristics after 250 hours in weatherometer.
 - 6) VOC Content: 165 g/L, maximum.
- C. Miscellaneous Materials:
- 1. Joint Cleaner: As recommended by caulking and sealant manufacturer.
 - 2. Joint Primer and Sealer: As recommended for compatibility with caulking and sealant by caulking and sealant manufacturer.
 - 3. Bond Breaker Type: Polyethylene tape or other plastic tape as recommended for compatibility with caulking and sealant by caulking and sealant manufacturer, to be applied to sealant-contact surfaces where bond to substrate or joint filler must be avoided for proper performance of caulking and sealant. Provide self-adhesive tape where applicable.
 - 4. Sealant Backer Rod: Compressible rod stock polyethylene foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable nonabsorptive material as recommended for compatibility with caulking and sealant by caulking and sealant manufacturer. Provide size and shape of rod that will control joint depth for sealant placement, break bond of sealant at bottom of joint, form optimum shape of sealant bead on back side, and provide highly-compressible backer to minimize possibility of sealant extrusion when joint is compressed.
 - 5. Low-temperature Catalyst: As recommended by caulking and sealant manufacturer.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine joint surfaces, substrates, backing, and anchorage of units forming sealant rabbet, and conditions under which caulking, and sealant Work will be performed, and notify Engineer in writing of conditions detrimental to proper and timely completion of the Work and performance of sealants. Do not proceed with caulking and sealant Work until unsatisfactory conditions are corrected.

- B. Laboratory Pre-construction 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 C1087 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 at least 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 products that fail tests, obtain joint-sealant manufacturer's written instructions for corrective measures including using specially formulated primers.
 - 5. Immersion Testing: ASTM C1247 for potable water and wastewater.
 - 6. Testing will not be required if joint sealant manufacturers submit joint preparation data based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted and mock-up field testing is acceptable.

3.2 PREPARATION

- A. Protection: Do not allow caulking and sealants to overflow or spill onto adjoining surfaces, or to migrate into voids of adjoining surfaces including rough textured materials. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces, by either the primer/sealer or caulking and sealant materials.

- B. Joint Surface Preparation:
 - 1. Clean joint surfaces immediately before installing sealant compound. Remove dirt, weakly adhering coatings, moisture and other substances that would interfere with bonds of sealant compound as recommended in sealant manufacturer's written instructions as shown on approved Shop Drawings.
 - 2. If necessary, clean porous materials by grinding, sandblasting, or mechanical abrading. Blow out joints with oil-free compressed air or by vacuuming joints prior to applying primer or sealant.
 - 3. Roughen joint surfaces on vitreous coated and similar non-porous materials, when sealant manufacturer's data indicates lower bond strength than for porous surfaces. Rub with fine abrasive cloth or steel wool to produce a dull sheen.

- C. Mixing:
 - 1. Comply with sealant manufacturer’s written instructions for mixing multi-component sealants.
 - 2. Thoroughly mix components before use.
 - 3. Add entire contents of activator can to base container. Do not mix partial units.
 - 4. Mix contents for minimum of five minutes or as recommended by sealant manufacturer, until color and consistency are uniform.

3.3 INSTALLATION

- A. Install caulking and sealants after adjacent areas have been cleaned and before joint has been cleaned and primed, to ensure caulking and sealant joints will not be soiled. Replace caulking and sealant joints soiled after installation.
- B. Comply with sealant manufacturer’s written instructions except where more stringent requirements are shown or indicated in the Contract Documents, and except where manufacturer’s technical representative directs otherwise, only as acceptable to Engineer.
- C. Prime or seal joint surfaces as shown on approved Shop Drawings and approved other submittals. Do not allow primer or sealer to spill or migrate onto adjoining surfaces. Allow primer to dry prior to applying sealants.
- D. Apply masking tape before installing primer, in continuous strips in alignment with joint edge to produce sharp, clean interface with adjoining materials. Remove tape immediately after joints have been sealed and tooled as directed.
- E. Do not install sealants without backer rods and bond breaker tape.
- F. Roll back-up rod stock into joint to avoid lengthwise stretching. Do not twist, braid, puncture, or prime backer rods.
- G. Employ only proven installation techniques that will ensure that sealants are deposited in uniform, continuous ribbons without gaps or air pockets, with complete “wetting” of joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.
- H. Install sealants to depths recommended by sealant manufacturer but within the following general limitations, measured at the center (thin) section of bead.
 - 1. For horizontal joints in sidewalks, pavements, and similar locations sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to depth equal to 75 percent of joint width, but not more than 5/8-inch deep or less than 3/8-inch deep.
 - 2. For vertical joints subjected to normal movement and sealed with elastomeric sealants and not subject to traffic, fill joints to a depth equal to 50 percent of joint

width, but not more than 1/2-inch deep or less than 1/4-inch deep.

- I. Remove excess and spillage of compounds promptly as the Work progresses.
- J. Cure caulking and sealant compounds in compliance with manufacturer's instructions and recommendations, to obtain high-early bond strength, internal cohesive strength, and surface durability.

3.4 EXISTING JOINTS

- A. Mechanically remove existing sealant and backer rod.
- B. Clean joint surfaces of residual sealant and other contaminants capable of affecting sealant bond to joint surface.
- C. Conduct laboratory pre-construction compatibility and adhesion testing on joint surfaces in accordance with Paragraph 3.1.B of this Section.
- D. Allow joint surfaces to dry before installing new sealants.

3.5 FIELD QUALITY CONTROL

- A. Post-construction Field Adhesion Testing: Before installing elastomeric sealants, field-test joint sealant adhesion to joint substrates as follows:
 - 1. Extent of Testing: Test completed elastomeric sealant joints as follows:
 - a. Perform ten tests for the first 1,000 feet of joint length for each type of elastomeric sealant and joint substrate.
 - b. Perform one test for each 1,000 feet of joint length thereafter, and minimum of one test per each floor per elevation.
 - c. Test Method: Test joint sealants according to Method A, Field-applied Sealant Joint Hand Pull Tab, and Method D, Water Immersion in Appendix X1 of ASTM C1193. For joints with dissimilar substrates, verify adhesion to each substrate separately by extending cut along one side and verifying adhesion to opposite side. Repeat procedure for opposite side.
 - d. Inspect joints for complete fill, absence of voids, and joint configuration complying with specified requirements. Record results in a log of field adhesion tests.
 - e. Inspect tested joints and report on whether:
 - 1) Sealants in joints 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. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
 - 2) Sealants filled the joint cavities and are free of voids.
 - 3) Sealant dimensions and configurations comply with specified requirements.

- f. Record test results in a log of field adhesion tests. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
 - g. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
 - h. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other requirements will be satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.
 - i. Do not proceed with installation of elastomeric sealants over joint surfaces that have been painted, lacquered, waterproofed, or treated with water repellent or other treatment or coating unless a laboratory test for durability (adhesion), in compliance with FS TT-S-00227, has successfully demonstrated that sealant bond is not impaired by the coating or treatment. If laboratory test has not been performed or shows bond interference, remove coating or treatment from joint surfaces before installing sealant.
- B. Water Leak Testing: Field test for water leaks as follows:
- 1. Flood the joint exposure with water directed from a 3/4-inch diameter garden hose, without nozzle, held perpendicular to wall face, two feet from joint and connected to water system with 30 psi minimum normal water pressure. Move stream of water along joint at an approximate rate of 20 feet per minute.
 - 2. Test approximately five percent of total joint system, in locations that are typical of every joint condition, and that can be inspected easily for leakage on opposite face. Conduct test in presence of Engineer, who will determine actual percentage of joints to be tested and actual period of exposure to water from hose, based on extent of observed leakage or lack of observed leakage.
 - 3. Where nature of observed leaks indicates potential of inadequate joint bond strength, Engineer may direct that additional testing be performed at a time when joints are fully cured, and before Substantial Completion.

3.6 ADJUSTING AND CLEANING

- A. Where leaks and lack of adhesion are evident, replace sealant.
- B. Clean adjacent surfaces of sealant and soiling resulting from the Work. Use solvent or cleaning agent recommended by sealant manufacturer. Leave all finish Work in neat, clean condition.
- C. Protect sealants during construction so that they will be without deterioration, soiling, or damage at time of readiness for final payment of the Contract.

3.7 PROTECTION

- A. During and after curing period, protect joint sealants from contact with contaminating substances and from damage resulting from construction operations or other causes, so sealants 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 installations with repaired areas are indistinguishable from original Work.

– END OF SECTION –

CONTRACT No. 22-523
DIVISION 7 – THERMAL AND MOISTURE PROTECTION

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SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

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. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Louvers installed in hollow metal doors.
4. Light frames and glazing installed in hollow metal doors.

B. Related Sections:

1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
2. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
3. Division 08 Section "Door Hardware".
4. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.
- B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.
- C. Shop Drawings: Include the following:
 1. Elevations of each door design.
 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 4. Locations of reinforcement and preparations for hardware.
 5. Details of anchorages, joints, field splices, and connections.
 6. Details of accessories.
 7. Details of moldings, removable stops, and glazing.
 8. Details of conduit and preparations for power, signal, and control systems.
- D. Samples for Verification:
 1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.
- B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".
- 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 UL10C (neutral pressure at 40" above sill) or UL 10C.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
 2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
 3. Smoke Control Door Assemblies: Comply with NFPA 105.
 - a. Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.
- D. Fire-Rated, Borrowed-Light Frame Assemblies: 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 according to NFPA 257. Provide labeled glazing material.
- E. Energy Efficient Exterior Openings: Comply with minimum thermal ratings, based on ASTM C1363. Openings to be fabricated and tested as fully operable, thermal insulating door and frame assemblies.- 1. Thermal Performance (Exterior Openings): Independent testing laboratory certification for exterior door assemblies being tested in accordance with ASTM C1363 and meet or exceed the following requirements:
 - a. Door Assembly Operable U-Factor and R-Value Ratings: U-Factor 0.37, R-Value 2.7, including insulated door, thermal-break frame and threshold.
- 2. Air Infiltration (Exterior Openings): Independent testing laboratory certification for exterior door assemblies being tested in accordance with ASTM E283 to meet or exceed the following requirements:
 - a. Rate of leakage of the door assembly shall not exceed 0.25 cfm per square foot of static differential air pressure of 1.567 psf (equivalent to 25 mph wind velocity).

F. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

 - A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.
 - B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
 - 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

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 within specified warranty period.
- B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:
 - 1. CECO Door Products (C).
 - 2. Curries Company (CU).
 - 3. Pioneer Industries (PI).

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

- A. General: Provide 1-3/4 inch 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 and ANSI/NAAMM HMMA 867.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

- B. Exterior Doors (Energy Efficient): Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A924 A60. 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. Design: Flush panel.
 2. Core Construction: Foamed in place polyurethane and steel reinforced core with no stiffener face welds.
 - a. Provide 18 gauge steel vertical reinforcements 6 inches apart and welded in place. Foamed in place polyurethane core is chemically bonded to all interior surfaces. No face welding is permitted.
 - b. Thermal properties to rate at a fully operable minimum U-Factor 0.37 and R-Value 2.6, including insulated door, Mercury thermal-break frame and threshold.
 - c. Kerf Type Frames: Thermal properties to rate at a fully operable minimum U-Factor 0.38 and R-Value 2.6, including insulated door, kerf type frame, and threshold.
 3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053-inch - 1.3-mm) thick steel, Model 2.
 4. Vertical Edges: Vertical edges to be mechanically interlocked with hairline seam. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
 5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
 6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".
 7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. 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. Design: Flush panel.
 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.
 - a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
 3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
 4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
 5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Manufacturers Basis of Design:

1. Curries Company (CU) - Polystyrene Core - 707 Series.
2. Curries Company (CU) - Energy Efficient - 797 Mercury Series.

2.4 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Thermal Break Frames: Subject to the same compliance standards and requirements as standard hollow metal frames. Tested for thermal performance in accordance with NFRC 102, and resistance to air infiltration in accordance with NFRC 400. Where indicated provide thermally broken frame profiles available for use in both masonry and drywall construction. Fabricate with 1/16" positive thermal break and integral vinyl weatherstripping.

C. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.
3. Manufacturers Basis of Design:

a. Curries Company (CU) – Thermal Break TQ Series.

D. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
3. Manufacturers Basis of Design:

a. Curries Company (CU) - C CG Series.

b. Curries Company (CU) - M G Series.

E. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

F. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

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 and not less than 0.042 inch thick.
3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.

D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.7 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.8 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. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.

D. Hollow Metal Frames:

1. Shipping Limitations: 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.
2. Welded Frames: Weld joints continuously through full throat width of frames, including rabbets, soffits, and stops; grind, fill, dress, and make smooth, flush, and invisible.
 - a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
3. 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.
4. Equal Rabbet Frames: Provide frames with equal rabbet dimensions unless glazing and removable stops require wider dimensions on glass side of frame.
5. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
9. 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.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

- 5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
 10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
 11. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.
- E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 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 non-template, 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.
 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.9 STEEL FINISHES

- A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
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; and compatible with substrate and field-applied coatings.

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. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).
- 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, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.
- C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Drill and tap doors and frames to receive non-template, 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 and NFPA 80 at fire rated openings.
 - 1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
 - 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
 - 4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - 1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
 - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

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 and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

END OF SECTION 081113

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SECTION 08 14 33 – STILE AND RAIL WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment and services necessary to complete the Custom Exterior Solid Wood Doors as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Replacement of historic exterior wood doors
 - 2. Exterior wood doors and transoms.
 - 3. Exterior Barn door

1.3 RELATED SECTIONS:

- A. Rough Carpentry - Section 061000.
- B. Finish Carpentry – Section 062000
- C. Joint Sealants - Section 079200.
- D. Door Hardware – Section 087100
- E. Glass and Glazing - Section 088000.
- F. Painting and Finishing - Section 099100.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product, including the following:
 - 1. Details of construction and glazing.
 - 2. Door frame construction.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data, including those for stiles, rails, panels, and moldings (sticking); and other pertinent data, including the following:
 - 1. Door schedule indicating door and frame location, type, size, and swing.
 - 2. Door elevations, dimensions and location of hardware, lite locations, and glazing thickness.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

3. Details of frame for each frame type, including dimensions and profile.
4. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
5. Dimensions and locations of mortises and holes for hardware.
6. Clearances and undercuts.
7. Doors to be factory primed.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For door inspector.
- B. Field quality control reports.
- C. Sample Warranty: For special warranty.

1.6 QUALITY ASSURANCE

- A. Fabricator's Qualifications: Company specializing in Fabricating historic door replacement with a minimum of five years documented experience.
- B. Single Source Requirements: To the greatest extent practical, wood doors shall be supplied from a single fabricator

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and fabricator's written instructions.
- B. Package doors individually in opaque plastic bags or cardboard cartons.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.8 FIELD 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 temperature and relative humidity levels designed for building occupants for the remainder of construction period.

1.9 WARRANTY

- A. Special Warranty: Fabricator agrees to repair or replace doors and frames that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors and frames.
3. Warranty shall be in effect during specified period of time from date of Substantial Completion.
4. Warranty Period for Exterior Doors: Ten years.
5. Warranty Period for Glass Panels: Five years.

PART 2 - PRODUCTS

2.1 FABRICATORS

- A. Source Limitations: Obtain custom stile and rail wood doors from single Fabricator.

2.2 MATERIALS

- A. Use only materials that comply with referenced standards and other requirements specified.
 1. Assemble exterior doors, including components, with wet-use adhesives complying with ASTM D5572 for finger joints and with ASTM D5751 for joints other than finger joints.
- B. Safety Glass: Provide products complying with testing requirements in 16 CFR 1201, for Category II materials, unless those of Category I are expressly indicated and permitted.

2.3 EXTERIOR STILE AND RAIL WOOD DOORS

- A. Exterior Stile and Rail Wood Doors: Exterior custom doors complying with the AWI, AWMAC, and WI's Architectural Woodwork Standards, WDMA I.S. 6A, and with other requirements specified.
 1. Performance Grade: WDMA I.S. 6A Heavy Duty.
 2. Architectural Woodwork Standards Grade: Custom.
 3. Panel Design:
 - a. Replacement doors should match the original door design and materials as closely as possible.
 - b. New doors should be compatible in material, composition and profile with the original doors of the building.
 4. Finish: Opaque.
 5. Door Construction:
 - a. Stile and Rail Construction: Clear solid softwood; may be edge glued for width and finger jointed.
 - b. Panel Construction: Clear solid softwood lumber; edge glued for width.
 - c. Veneered construction is not acceptable.

6. Thickness: 1-3/4 inches.
7. Glass: Uncoated, clear, laminated glass made from two lites of 3.0-mm-thick annealed glass, complying with Section 088000 "Glazing."

2.4 STILE AND RAIL WOOD DOOR FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels unless otherwise indicated:
 1. Clearances:
 - a. Provide 1/8 inch (3 mm) at heads, jambs, and between pairs of doors.
 - b. Provide 1/2 inch (13 mm) from bottom of door to top of decorative floor finish or covering.
 - c. Where threshold is shown on Drawings or scheduled, provide not more than 3/8 inch (10 mm) from bottom of door to top of threshold.
 2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
- B. Factory machine doors for hardware that is not surface applied.
 1. Locate hardware to comply with DHI-WDHS-3.
 2. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
 3. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.
 4. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- C. Glazed Openings: Trim openings indicated for glazing with solid-wood moldings, with one side removable. Miter wood moldings at corner joints.
- D. Transom:
 1. Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors.
 2. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
 3. Fabricate door and transom panels with full-width, solid-lumber, rabbeted, meeting rails.
- E. Factory treat exterior doors with water-repellent preservative after fabrication has been completed but before shop priming.
 1. Comply with WDMA I.S. 4.
 2. Flash top of outswinging doors with fabricator's standard metal flashing.
- F. Barn Door Hardware:

Provide Heavy Duty flat track exterior hardware with floor guide and pull in powder-coated finish. Color : Black

2.5 FACTORY PRIMING

- A. Shop prime faces, all four edges, edges of cutouts, and mortises with one coat of wood primer specified in Section 099100 Painting and Finishing

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
 - 1. Verify that installed 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. Hardware: For installation, see Section 087100 - Door Hardware.
- B. Install doors and frames to comply with Fabricator's written instructions and referenced quality standard, and as indicated.
- C. Align in frames for uniform clearance at each edge.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.

END OF SECTION 08 14 33

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SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes access doors and frames for walls and ceilings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each type of access door and frame and for each finish specified.
- C. Product Schedule: For access doors and frames. Refer to Drawings.

1.3 CLOSEOUT SUBMITTALS

- A. Record Documents: For fire-rated doors, list of applicable room name and number in which access door is located.

1.4 QUALITY ASSURANCE

- A. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies shall meet the qualifications set forth in NFPA 80, section 5.2.3.1 and the following:
 - 1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection and temperature-rise limit ratings indicated, according to NFPA 252 or UL 10B.

2.2 ACCESS DOORS AND FRAMES

- A. Flush Access Doors with Exposed Flanges: Refer to Drawings.
 - 1. Description: Face of door flush with frame, with exposed flange and concealed hinge.
 - 2. Locations: Wall and ceiling

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

3. Uncoated Steel Sheet for Door: Nominal 0.060 inch (1.52 mm), 16 gage factory primed, finished. Color selected by Architect.
 4. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch (1.63 mm), 16 gage factory primed, finished.
 5. Stainless Steel Sheet for Door: Nominal 0.062 inch (1.59 mm), 16 gage ASTM A480/A480M No. 4 finish.
 6. Frame Material: Same material, thickness, and finish as door.
 7. Latch and Lock: Cam latch, screwdriver operated., with interior release.
- B. Flush Access Doors with Concealed Flanges. Refer to drawings.
1. Description: Face of door flush with frame; with concealed flange for gypsum board installation and concealed hinge.
 2. Locations: Wall and ceiling
 3. Uncoated Steel Sheet for Door: Nominal 0.060 inch (1.52 mm), 16 gage, factory primed, finished.
 4. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch (1.63 mm), 16 gage factory primed, finished.
 5. Stainless Steel Sheet for Door: Nominal 0.062 inch (1.59 mm), 16 gage, ASTM A480/A480M No. 4 finish.
 6. Frame Material: Same material and thickness as door.
 7. Latch and Lock: Cam latch, screwdriver operated with interior release.
- C. Lightweight Flush Access Doors: Refer to drawings.
1. Description: Face of door flush with exposed flange, with exposed piano hinge; frameless for surface installation.
 2. Locations: Wall and ceiling.
 3. Uncoated Steel Sheet for Door: Nominal 0.018 inch (0.46 mm), 26 gage factory primed, finished.
 4. Metallic-Coated Steel Sheet for Door: Nominal 0.022 inch (0.56 mm), 26 gage, factory primed, finished.
 5. Frame Material: Aluminum, nominal 0.045 inch (1.15 mm), mill finish. As indicated on drawings.
 6. Latch and Lock: Cam latch, screwdriver operated, with interior release.
- D. Interior Flush GFRG Access Doors with Concealed Flanges: N/A
- E. Floor Access Door with Non-Drainage Channel Frame: Refer to drawings.
1. Basis of Design: Bilco TER-1
 2. Description: 1” Fillable pan-type cover designed to accept flooring materials, continuous stainless steel hinge, with compression spring operators.
 3. Locations: Floor
 4. Aluminum Door: .25 inch reinforced pan-type cover, mill finish
 5. Frame Material: Extruded aluminum with built-in anchor flange, bituminous coating applied to exterior surface
 6. Latch: Stainless steel slam lock with removable exterior turn/lift handle.

2.3 FIRE-RATED ACCESS DOORS AND FRAMES

- A. Fire-Rated, Flush Access Doors with Exposed Flanges. Refer to drawings.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

1. Description: Door face flush with frame, with a core of mineral-fiber insulation enclosed in sheet metal] [uninsulated]; with exposed flange, self-closing door, and concealed hinge.
2. Locations: Wall and ceiling.
3. Fire-Resistance Rating: Not less than that of adjacent construction 1 hour.
4. Temperature-Rise Rating: 450 deg F (250 deg C), 250 deg F (139 deg C) at the end of 30 minutes.
5. Uncoated Steel Sheet for Door: Nominal 0.036 inch (0.91 mm), 20 gage, factory primed, field finished. Color to be selected by Architect.
6. Metallic-Coated Steel Sheet for Door: Nominal 0.040 inch (1.02 mm), 20 gage, factory primed and field finished. Color to be selected by Architect.
7. Stainless Steel Sheet for Door: Nominal 0.038 inch (0.95 mm), 20 gage, ASTM A480/A480M No. 4 finish.
8. Frame Material: Same material, thickness, and finish as door.
9. Latch and Lock: Self-latching door hardware, operated by knurled-knob, with interior release.

B. Fire-Rated, Flush Access Doors with Concealed Flanges. Refer to drawings.

1. Description: Door face flush with frame, [with a core of mineral-fiber insulation enclosed in sheet metal, ; with concealed flange for gypsum board, plaster installation, self-closing door, and concealed hinge.
2. Locations: Wall and ceiling.
3. Fire-Resistance Rating: Not less than that of adjacent construction, 1 hour.
4. Temperature-Rise Rating: 450 deg F (250 deg C), 250 deg F (139 deg C) at the end of 30 minutes.
5. Uncoated Steel Sheet for Door: Nominal 0.036 inch (0.91 mm), 20 gage, factory primed, finished.
6. Metallic-Coated Steel Sheet for Door: Nominal 0.040 inch (1.02 mm), 20 gage, factory primed, finished.
7. Stainless Steel Sheet for Door: Nominal 0.038 inch (0.95 mm), 20 gage, ASTM A480/A480M No. 4 finish.
8. Frame Material: Same material, thickness, and finish as door.
9. Latch and Lock: Self-closing, self-latching door hardware, operated by knurled-knob, with interior release.

2.4 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A879/A879M, with cold-rolled steel sheet substrate complying with ASTM A1008/A1008M, Commercial Steel (CS), exposed.
- C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- D. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666, Type 304, Type 316. Remove tool and die marks and stretch lines, or blend into finish.
- E. Frame Anchors: Same material as door face.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

- F. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.

2.5 FABRICATION

- A. 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.
- B. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.
- C. Latch and Lock Hardware:
 - 1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
 - 2. Keys: Furnish two keys per lock and key all locks alike.
 - 3. Mortise Cylinder Preparation: N/A

2.6 FINISHES

- A. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
 - 2. Factory Finished: Apply manufacturer's standard baked-enamel or powder-coat finish immediately after cleaning and pretreating, with minimum dry-film thickness of 1 mil (0.025 mm) for topcoat.
 - a. Color: As selected by Architect from full range of industry colors.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Adjust doors and hardware, after installation, for proper operation.

3.2 FIELD QUALITY CONTROL

- A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.
- B. Inspections:

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

1. Fire-Rated Door Inspections: Inspect each fire-rated access door in accordance with NFPA 80, section 5.2.
- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- E. Prepare and submit separate inspection report for each fire-rated access door indicating compliance with each item listed in NFPA 80 and NFPA 101.

END OF SECTION 083113

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SECTION 08 33 00 – OVERHEAD BIFOLD DOORS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Furnish Overhead Bifold System complete from one manufacturer. Provide all labor, materials, tools, and equipment to furnish the Bifold System complete as herein specified.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the overhead bifold doors as shown on the Drawings and specified herein, including, but not limited to, the following:
 - 1. Metal fabrications.
 - 2. Glass and Glazing.
 - 3. Power Operator (Hydraulic)
 - 4. Linear Actuator (Electric)

1.3 RELATED SECTIONS

- A. Section 05 50 00 – Metal Fabrications and Anchorage
- B. Section 06 10 53 – Wood Nailers and Blocking
- C. Section 07 92 00 – Joint Sealants
- D. Section 08 71 00 – Door Hardware
- E. Section 09 91 00 – Painting and Finishing
- F. Section 26 05 83 – Wiring Connections

1.4 REFERENCES

- A. ASTM C1048 – Glass Tempered
- B. ASTM A513, Type 1 – Steel Tubes
- C. ASTM A36 – Steel Bars
- D. ASTM A36 – Sheet Steel for Tracks/ Channels

1.5 SUBMITTALS

- A. Product data for each type of product specified, including details of construction relative to materials, dimensions of individual components, profiles, textures, and colors.
- B. Samples for initial selection purposes in form of manufacturer's sample finishes chart showing full range of colors and profiles available.
- C. Samples for verification in the form of 3 inches square, representing actual product, color or patterns. Provide two samples.
- D. Shop Drawings, including plans and elevations including opening dimensions, connection details, anchorage spacing hardware locations and installation details.
- E. Installation, Operation, and Maintenance Data.

1.6 QUALITY ASSURANCE

- A. Provide each Bifold System as a complete unit by one manufacturer, including frame, operable panel, glass and glazing, brackets, guides, hardware, operators, and installation accessories to suit opening.
- B. Installer Qualifications: Authorized representative of the manufacturer with minimum five years documented experience and/or be a factory trained and authorized installation company.
- C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.
- D. Wind Loading: Design and reinforce overhead bifold system to withstand a wind loading pressure to comply with state and local code requirements.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site in manufacturer's unopened containers or packaging with labels intact.
- B. Store materials at site to prevent water damage, staining, or other physical damage. Comply with manufacturer's recommendations for job site storage, handling and protection.
- C. Handling: Handle and lift all items carefully during installation to prevent damage and protect finishes.

1.8 PROJECT CONDITIONS

- A. Pre-Installation Conference: Convene a pre-installation conference prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
- B. Weather Conditions: Prior to and during installation, environmental conditions shall be in accordance with door manufacturers latest published recommendations for temperature, rain, wind, humidity, ventilation, and illumination

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

- C. Opening shall be free and clear of debris, stored materials, scaffolding, and temporary walls as necessary for installers to perform the installation.

1.9 WARRANTY

- A. All materials and components, supplied by Crown, shall be guaranteed against defects in material and workmanship, for a period of one year from date of delivery.
- B. Materials and components supplied by other than Crown not included in this warranty.
- C. Reference std. Crown warranties for further information.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Subject to compliance with requirements, provide products from the following:

- 1. Crown Doors, LLC
135 McLeod Avenue South
Plato, MN. 55370
(320) 238-2616
www.crowndoors.com
info@crowndoors.com

2.2 MATERIALS

- A. Product to be Overhead Bifold Door System as furnished by Crown Doors, LLC
 - 1. Construct operable panel and frame sections with structural steel (of ASTM-A500 grade minimum) framing to comply with applied wind code.
 - 2. Operable panels and frame shall be constructed of structural steel tubing, and other structural steel shapes, and shall be designed to the same loading requirements for live, dead and wind loads as the surrounding construction.
 - 3. System shall be designed so that no center “cane bolt” is required in the floor.
 - 4. Operable panels and frame shall be factory-welded at all joints and connections, with smooth welds not to exceed 1/4” thickness.
 - 5. Inside-Sash (infill) glass retainer system shall be factory pre-installed and seam-sealed, and necessary setting blocks, spacers, butyl and foam tape shall be supplied.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

6. System frame, operable panels, and factory pre-installed, inside-sash glass retainer shall be primed with gray-zinc, powder-based, epoxy primer, and finished with manufacturer's standard powder-coat.
7. Factory-Supplied neoprene seals/weather stripping will be shipped loose for field-install to protect against damage during transport.

B. SST-II Hydraulic Bifold System

1. Hydraulic Bifold System shall be operated by hydraulic cylinders that are mechanically fastened to the panel frame.
 - a. Cylinders are to be located on the top half of the door, only. Cylinders will be designed to carry the required loads during operation, open position, and closed position. Internal stops will be installed so as not to allow over-extension of the cylinders, therefore restricting the system from opening or closing beyond its limit.
 - b. Lift straps or cables, horizontal top and bottom drive shafts, pulleys, and strap or cable "kick outs" are unacceptable.
 - c. System shall be locked closed by means of the hydraulic cylinders providing a minimum of 1,000 lbs. of closing force.
2. Power Operator - Standard voltage is 208-230v, single phase.
 - a. Constant contact push-button or key-switch controls for separate mounting.
 - b. Power unit to power (2) hydraulic cylinders which open and close the system. Power unit to be pre-wired and factory tested.
 - c. "Open-Close" control units will be wired for constant-hold operation.
 - d. Incoming electrical source to hydraulic power unit to be supplied by others (manufacturer's standard).
 - e. Each door operator shall have thermal overload protection for the motor.

C. SST-II Electric Bifold System

1. Electric Bifold System shall be operated by linear actuators that are mechanically fastened to the panel frames.
 - a. Actuators are to be located on the top half of the door, only. Actuators will be designed to carry the required loads during operation, open position, and closed position.
 - b. Speed: Approx. 30-40 seconds to fully-open or fully-closed position.
 - c. System shall be locked closed by means of the linear actuators drawing operable panels against system frame; No additional locking mechanisms necessary.
2. Power: Standard 120v, single-phase, 10-amp.
 - a. Constant contact push-button or key-switch controls for separate mounting.
 - b. Control switch to operate (2) linear actuators which open and close the system. System wire box, control switch and actuators are to be pre-wired, factory tested and provided with supply cables for final hook-up (by others).
 - c. "Open-Close" control units will be wired for constant-hold operation.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

- d. Incoming electrical source to wire box to be supplied by others.
- e. Each linear actuator shall have thermal overload protection for the motor.

D. Finishes:

- 1. Entire system frame, operable panels, and factory pre-installed, inside-sash glass retainer shall be primed with gray-zinc, powder-based, epoxy primer, and finished with manufacturer's standard powder-coat.
 - a. Optional Finishes
 - 1). RAL powder-coat colors in gloss or satin
 - 2). Custom matched powder-coat color

E. Glazing:

- 1. Glazed in accordance with AS1288.
- 2. Glass to be 1/4 inch laminated safety glass with ceramic frit. See drawings for frit pattern. (Max panel size 18 sq. ft)
- 3. Glazing to be factory cut and installed. All pieces to be test fit in factory prior to shipping.
- 4. Panels: There are no panels

F. Size:

- 1. As indicated on drawings

G. Accessories:

- 1. Photoelectric or lead-edge pressure sensor that stops (or stops and reverses) the downward movement of the door/window.
- 2. External, weather-resistant, "open-close" keyed control wired for constant-hold

2.3 OPERATION

- A. The Hydraulic Bifold System shall be extended/retracted in the opening using a constant-contact key switch, operating hydraulic cylinders mounted to the system frame.
- B. The Electric Bifold System shall be extended/retracted in the opening using a constant-contact key switch, operating linear actuators mounted to the system frame.

PART 3 EXECUTION

- A. Notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the project conditions. Commencement of installation constitutes acceptance of conditions.

3.1 EXAMINATION

- A. Do not begin installation until openings have properly been prepared.
- B. Verify wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.
- C. Verify electric power is available and of correct characteristics.
- D. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding

3.2 SAFETY

- A. Hydraulic bifold system
 - 1. Hydraulic power unit to have a manual emergency let-down valve for closing the system in case of a power outage.
 - 2. System to incorporate pressure compensated orifice valves.
 - 3. System to incorporate photoelectric or lead-edge pressure sensor.
- B. Electric bifold system
 - 1. System to have hand-crank manual operation available in case of a power outage.
 - 2. Photoelectric or lead-edge pressure sensor optional.

3.3 INSTALLATION

- A. Installation of the Bifold System shall be by a contractor familiar with this type of installation and be in strict accordance with the approved build drawings and manufacturers standard printed specifications, instructions, and recommendations. All moving parts will be left in good operating condition.
- B. Permanent or temporary electric wiring shall be brought to the power unit location before installation. After the Bifold System is installed, the general contractor assumes the responsibility of any damage to the system or system components during construction until the building is turned over to the owner.
- C. Hydraulic bifold system:
 - 1. Fill reservoir with hydraulic fluid (provided by others). Use ATF for cold weather applications or #32 hydraulic fluid for all other applications

3.4 CLEANING AND ADJUSTING

- A. Lubricate, test and adjust door assembly to smooth operation free from warp, twist or distortion and in full contact with weather-stripping.
- B. All surfaces shall be wiped clean and free of handprints, grease, and oil.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

- C. Remove temporary labels and visible markings.

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up damaged coatings and finishes and repair minor damage before Substantial Completion.

3.6 MAINTENANCE

- A. Post Installation Maintenance:
 - 1. Contractor and installer shall provide Owner with complete company name, address phone number, fax number and assigned contact for emergency repairs and scheduled maintenance for the installed door(s).

3.7 TRAINING

- A. Installer shall demonstrate proper operation and maintenance procedures to owner's representative.
- B. Operating keys and owner's manual shall be provided to owner's representative.

END OF SECTION

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SECTION 08 33 13 - COILING COUNTER DOORS

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. Counter doors.
- 2. Fire-rated counter doors.

B. Related Requirements:

- 1. Section 055000 "Metal Fabrications" for door-opening framing and corner guards.
- 2. Section 099123 "Interior Painting" for finish painting of factory-primed doors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of coiling counter door and accessory.

- 1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
- 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- 3. Include description of automatic closing device and testing and resetting instructions.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

- 1. Include plans, elevations, sections, and mounting details.
- 2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
- 3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
- 4. Show locations of controls, locking devices, detectors or replaceable fusible links and other accessories.
- 5. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.

- 1. Include similar Samples of accessories involving color selection.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

- D. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:
1. Curtain slats
 2. Bottom bar with sensor edge.
 3. Guides.
 4. Brackets.
 5. Hood.
 6. Laminate-clad counter panel product for each type, color, pattern, and surface finish; laminated to core.
 7. Locking device(s).
 8. Include similar Samples of accessories involving color selection.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For **Installer and testing and inspecting agency**.
1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, section 5.2.3.1.
 2. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.
- B. Oversize Construction Certification: For door assemblies required to be fire-rated and that exceed size limitations of labeled assemblies.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For coiling counter doors to include in maintenance manuals.
- B. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
1. Maintenance Proximity: Not more than **two** hours' normal travel time from Installer's place of business to Project site.
- B. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies shall meet the qualifications set forth in NFPA 80, section 5.2.3.1 and the following:
1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain coiling counter doors from single source from single manufacturer.
 - 1. Obtain operators and controls from coiling counter door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Complying with NFPA 80; 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. 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.
 - 2. Temperature-Rise Limit: [**Where indicated**] [**At exit enclosures and exit passageways**], provide doors that have a maximum transmitted temperature end point of not more than **450 deg F (250 deg C)** above ambient after 30 minutes of standard fire-test exposure.
 - 3. Smoke Control: [**Where indicated**] [**In corridors and smoke barriers**], provide doors that are listed and labeled with the letter "S" on the fire-rating label by a qualified testing agency for smoke- and draft-control based on testing according to UL 1784; with maximum air-leakage rate of **3.0 cfm/sq. ft. (0.01524 cu. m/s x sq. m)** of door opening at **0.10 inch wg (24.9 Pa)** for both ambient and elevated temperature tests.
- B. Sound-Control Doors: Assemblies tested in a laboratory for sound-transmission-loss performance according to ASTM E90, calculated according to ASTM E413, and rated for not less than the STC value indicated.

2.3 COUNTER DOOR ASSEMBLY - Refer to door schedule

- A. Counter Door: Coiling counter door formed with curtain of interlocking metal slats.
- B. Operation Cycles: Door components and operators capable of operating for not less than **50,000**. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
 - 1. Include tamperproof cycle counter.
- C. STC Rating: [**26**]
- D. Curtain R-Value: **4.5 deg F x h x sq. ft./Btu (0.792 K x sq. m/W)**
- E. Door Curtain Material: **Aluminum**.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

- F. Door Curtain Slats: **Flat** profile slats of **1-1/2-inch (38-mm)** center-to-center height.
 - 1. Insulated-Slat Interior Facing: **Metal**
 - 2. Gasket Seal. Manufacturer's standard continuous gaskets between slats.
- G. Bottom Bar: Manufacturer's standard continuous channel or tubular shape, fabricated **aluminum extrusion** and finished **to match door**
- H. Curtain Jamb Guides: **Aluminum** with exposed finish matching curtain slats. **Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise. Provide removable post(s) and jamb guides where indicated on Drawings.**
- I. Hood: **Aluminum.**
 - 1. Shape: **Square and as indicated on Drawings**
 - 2. Mounting: **Face of wall and as indicated on Drawings.**
- J. Integral Frame, Hood, and Fascia: Aluminum.
 - 1. Mounting: **Face of wall. and as indicated on Drawings.**
- K. Sill Configuration: **No sill**
- L. Locking Devices: Equip door with **slide bolt for padlock**
 - 1. Locking Device Assembly: **Cremona-type, both jamb sides** locking bars, operable from **inside with thumbturn** Retain "Manual Door Operator" or "Electric Door Operator" Paragraph below.
- M. Manual Door Operator: **Manufacturer's standard crank operator**
 - 1. Provide operator with through-wall shaft operation.
 - 2. Provide operator with manufacturer's standard removable operating arm.
- N. Electric Door Operator:
 - 1. Usage Classification: **Standard duty, up to 25 cycles per hour and up to 90 cycles per day**
 - 2. Operator Location: **Front of hood**
 - 3. Motor Exposure: **Interior**
 - 4. Motor Electrical Characteristics:
 - a. Horsepower: 1/2hp for 10'x10' door, 1hp for 20'x10' door (sizes approximate).
 - b. Voltage: 120v and 208v are available, single phase, 60 Hz.
 - c. Voltage: 120v and 208v are available, three phase, 60 Hz.
 - 5. Emergency Manual Operation: [**Crank**] type.
 - 6. Obstruction-Detection Device: Automatic **sensor edge on bottom bar**
 - a. Sensor Edge Bulb Color: **Black.** Indicate on Drawings which side of door is exterior face if it is not obvious.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

7. Control Station(s): **Interior-side mounted**
 8. Other Equipment:
- O. Curtain Accessories: Equip door with **smoke seals, weather seals, push/pull handles, pull-down strap, automatic closing device.**
- P. Door Finish:
1. Aluminum Finish: **Anodized color as selected by Architect from full range of industry colors and color densities.**
 2. Baked-Enamel or Powder-Coated Finish: **Color matching Architect's sample RAL 9001 Premium Powder Coating.**
 3. Factory Prime Finish: Manufacturer's standard color.
 4. Interior Curtain-Slat Facing: **Match finish of exterior curtain-slat face**
- 2.4 **FIRE-RATED COUNTER DOOR ASSEMBLY** - Refer to Door Schedule
- A. Fire-Rated Counter Door: Overhead fire-rated coiling door formed with curtain of interlocking metal slats.
- B. Operation Cycles: Door components and operators capable of operating for not less than **50,000**. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
1. Include tamperproof cycle counter.
- C. Fire Rating: **1 hour with temperature-rise limit and with smoke control.**
- D. STC Rating: **27**
- E. Curtain R-Value: **4.5 deg F x h x sq. ft./Btu (0.792 K x sq. m/W)**
- F. Door Curtain Material: **Stainless**] steel.
- G. Door Curtain Slats: **Flat** profile slats of **1-1/2-inch (38-mm)** center-to-center height.
1. Vision Panels: N/A
 2. Insulated-Slat Interior Facing: Metal.
- H. Curtain Jamb Guides: **Stainless** steel with exposed finish matching curtain slats.
- I. Hood: **Match curtain material and finish.**
1. Shape: **Square and as indicated on Drawings.**
 2. Mounting: **Face of wall** or as **indicated on Drawings.**
- J. Integral Frame, Hood, and Fascia: **Stainless** steel.
1. Mounting: **Face of wall or as indicated on Drawings.**
- K. Sill Configuration: **No sill**

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

1. High-Pressure Decorative Laminate: Match color, pattern, and finish **as indicated by manufacturer's designations.**
 - L. Locking Devices: Equip door with **slide bolt for padlock.**
 1. Locking Device Assembly: **Cremona-type, both jamb sides** locking bars, operable from **inside with thumbturn.**
 - M. Manual Door Operator: **Manufacturer's standard crank operator**
 1. Provide operator with through-wall shaft operation.
 2. Provide operator with manufacturer's standard removable operating arm.
 - N. Electric Door Operator:
 1. Usage Classification: **Standard duty, up to 25 cycles per hour and up to 90 cycles per day**
 2. Operator Location **Front of hood**
 3. Motor Exposure: **Interior**
 4. Motor Electrical Characteristics:
 5.
 - a. Horsepower: 1/2hp for 10'x10' door, 1hp for 20'x10' door (sizes approximate).
 - b. Voltage: 120v and 208v are available, single phase, 60 Hz.
 - c. Voltage: 120v and 208v are available, three phase, 60 Hz.
 6. Emergency Manual Operation: **Crank type.**
 7. Obstruction-Detection Device: Automatic electric sensor edge on bottom bar
 - a. Sensor Edge Bulb Color: **Black or as selected by Architect from manufacturer's full range.**
 8. Control Station(s): **Interior-side mounted**
 9. Other Equipment:
 - O. Curtain Accessories: Equip door with smoke seals, automatic closing device, **push/pull handles or pull-down strap.**
 - P. Door Finish:
 1. Baked-Enamel or Powder-Coated Finish: RAL 9001 Premium Powder Coating
 2. Factory Prime Finish: Manufacturer's standard color.
 3. Stainless Steel Finish:
 4. Interior Curtain-Slat Facing: **Match finish of exterior curtain-slat face**
- 2.5 MATERIALS, GENERAL
- A. 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.

2.6 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate coiling counter door curtain of interlocking metal slats in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
1. Steel Door Curtain Slats: N/A
 2. Stainless Steel Door Curtain Slats: N/A
 3. Aluminum Door Curtain Slats: **ASTM B209 (ASTM B209M)** sheet or extrusions, alloy and temper standard with manufacturer for type of use and finish indicated; thickness of **0.050 inch (1.27 mm)**; and as required.
 4. Vision-Panel Glazing:
 5. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E84 or UL 723. Enclose insulation completely within slat faces.
 6. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face.
 7. Plastic Interior: N/A
- B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.
1. Removable Posts and Jamb Guides: Manufacturer's standard.

2.7 HOODS

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
1. Galvanized Steel: N/A 0
 2. Stainless Steel: **0.025-inch- (0.64-mm-)** thick, stainless steel sheet, Type 304, complying with ASTM A666.
 3. Aluminum: **0.040-inch- (1.02-mm-)** thick aluminum sheet complying with **ASTM B209 (ASTM B209M)**, of alloy and temper recommended by manufacturer and finisher for type of use and finish indicated.
 4. Include automatic drop baffle on fire-rated doors to guard against passage of smoke or flame.
- B. Integral Frame, Hood, and Fascia: Welded sheet metal assembly of the following sheet metal(s):
1. Galvanized Steel: N/A
 2. Stainless Steel: Type 304, complying with ASTM A666.

- C. Removable Metal Soffit: Formed or extruded from same metal and with same finish as curtain if hood is mounted above ceiling unless otherwise indicated.

2.8 LOCKING DEVICES

- A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.
- B. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
 - 1. Lock Cylinders: As **specified in Section 087100 "Door Hardware" standard with manufacturer and keyed to building keying system.**
 - 2. Keys: **Three** for each cylinder.
- C. Chain Lock Keeper: Suitable for padlock.
- D. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.9 CURTAIN ACCESSORIES

- A. Smoke Seals: Equip each fire-rated door with replaceable smoke-seal perimeter gaskets or brushes for smoke and draft control as required for door listing and labeling by a qualified testing agency.
- B. Weatherseals: Equip door with weather-stripping gaskets fitted to entire perimeter of door for air-resistant installation unless otherwise indicated.
 - 1. At door head, use **1/8-inch- (3-mm-)** thick, replaceable, continuous-sheet baffle secured to inside of hood or field-installed on the header.
 - 2. At door jambs, use replaceable, adjustable, continuous, **flexible, 1/8-inch- (3-mm-) thick seals of flexible vinyl, rubber, or neoprene**
- C. Astragal: Equip each door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.
- D. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.
- E. Pull-Down Strap: Provide pull-down straps for doors more than **84 inches (2130 mm)** high.
- F. Poll Hooks:.
- G. Automatic-Closing Device: Equip each fire-rated door with an automatic-closing device or holder-release mechanism and governor unit complying with NFPA 80 and an easily tested and reset release mechanism. Automatic-closing device shall be designed for activation by the following:

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

1. Replaceable fusible links with temperature rise and melting point of **165 deg F (74 deg C)** interconnected and mounted on both sides of door opening.
2. Manufacturer's standard UL-labeled smoke detector and door-holder-release devices.
3. Manufacturer's standard UL-labeled heat detector and door-holder-release devices.
4. Building fire-detection, smoke-detection, and -alarm systems.

2.10 COUNTER DOOR ACCESSORIES

- A. Integral Metal Sill: N/A
- B. Fire-Rated, Laminate Counter: Fire-door manufacturer's high-pressure, decorative laminate-covered countertop; UL or ITS tested and labeled for 1-1/2-hour fire rating for approved use with fire-door assembly.

2.11 COUNTERBALANCE MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, **seamless** carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than **0.03 in./ft. (2.5 mm/m)** of span under full load.
- C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
 1. Fire-Rated Doors: Equip with auxiliary counterbalance spring and prevent tension release from main counterbalance spring when automatic closing device operates.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.12 MANUAL DOOR OPERATORS

- A. General: Equip door with manual door operator by door manufacturer.
- B. Push-up Door Operation: Design counterbalance mechanism so that required lift or pull for door operation does not exceed **25 lbf (111 N)**
- C. Chain-Hoist Operator:

- D. Crank Operator: Consisting of crank and crank gearbox, steel crank drive shaft, and gear-reduction unit, of type indicated. Size gears to require not more than **25-lbf (111-N)** force to turn crank. Fabricate gearbox to be oiltight and to completely enclose operating mechanism. Provide manufacturer's standard crank-locking device.

2.13 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
 - 1. Comply with NFPA 70.
 - 2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door Operator Location(s): Operator location indicated for each door.
 - 1. Top-of-Hood Mounted: N/A
 - 2. Front-of-Hood Mounted: N/A Operator is mounted to the right or left door head plate with the operator on coil side of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Front clearance is required for this type of mounting.
 - 3. Wall Mounted: N/A .
 - 4. Bench Mounted:
 - 5. Through-Wall Mounted: N/A.
- D. Motors: Reversible-type motor **with controller (disconnect switch)** for motor exposure indicated for each door assembly.
 - 1. Electrical Characteristics: Minimum as indicated for each door assembly. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than **8 in./sec. (203 mm/s)** and not more than **12 in./sec. (305 mm/s)**, without exceeding nameplate ratings or service factor.
 - 2. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
 - 3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
- E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- F. Obstruction-Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. **For fire-rated doors, activation delays closing.**

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
 - a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained or constant pressure on close button.
 2. Electric Sensor Edge: Automatic safety sensor edge, located within astragal mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
 - a. Self-Monitoring Type: Four-wire-configured device designed to interface with door operator control circuit to detect damage to or disconnection of sensor edge.
 3. Pneumatic Sensor Edge: Automatic safety sensor edge, located within astragal mounted to bottom bar. Contact with sensor activates device.
- G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."
1. Type: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
- H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed **25 lbf (111 N)**
- I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

2.14 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
- 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.

2.15 ALUMINUM FINISHES

- A. Powder-Coat Finish: AAMA 2605. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

2.16 STEEL AND GALVANIZED-STEEL FINISHES – N/A

2.17 STAINLESS STEEL FINISHES - N/A

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install coiling counter doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install coiling counter doors, hoods, controls, and operators at the mounting locations indicated for each door.
- C. Fire-Rated Doors: Install according to NFPA 80.
- D. Smoke-Control Doors: Install according to NFPA 80 and NFPA 105.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: **Engage** a qualified testing agency to perform tests and inspections and to furnish reports to Architect.
- B. Perform the following tests and inspections **with the assistance of a factory-authorized service representative**:
 - 1. Test door release, closing, and alarm operations when activated by smoke detector or building's fire-alarm system. Test manual operation of closed door. Reset door-closing mechanism after successful test.
 - 2. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, section 5.2.
- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

- E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in **NFPA 80 and NFPA 101**.

3.4 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.
 - 2. After electrical circuitry has been energized, operate doors to confirm proper motor rotation and door performance.
 - 3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.5 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide tight fit around entire perimeter.

3.6 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include six months' full maintenance by skilled employees of coiling-door Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 1. Perform maintenance, including emergency callback service, during normal working hours.
 - 2. Include 24-hour-per-day, seven-day-per-week, emergency callback service.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain coiling counter doors.

END OF SECTION 083313

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SECTION 083323 - OVERHEAD COILING DOORS

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. Service doors.
2. Insulated service doors.
3. Fire-rated service doors.
4. Fire-rated, insulated service doors.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for miscellaneous steel supports, door-opening framing, corner guards, and bollards.
2. Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" for finish painting of factory-primed doors.
3. Section 111200 "Parking Control Equipment" for parking control equipment interlocked to overhead coiling doors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
3. Include description of automatic-closing device and testing and resetting instructions.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

5. Show locations of controls, locking devices, detectors or replaceable fusible links, and other accessories.
 6. Include diagrams for power, signal, and control wiring.
- C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.
1. Include similar Samples of accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:
1. Curtain slats
 2. Bottom bar with sensor edge.
 3. Guides.
 4. Brackets.
 5. Hood.
 6. Locking device(s).
 7. Include similar Samples of accessories involving color selection.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing and inspecting agency.
1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, section 5.2.3.1.
 2. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.
- B. Oversize Construction Certification: For door assemblies required to be fire-rated and that exceed size limitations of labeled assemblies.
- C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Special warranty.
- B. Maintenance Data: For overhead coiling doors to include in maintenance manuals.
- C. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

1. Maintenance Proximity: Not more than **two** hours' normal travel time from Installer's place of business to Project site.
- B. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies shall meet the qualifications set forth in NFPA 80, section 5.2.3.1 and the following:
 1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of doors that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.
 1. Obtain operators and controls from overhead coiling-door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Complying with NFPA 80; listed and labeled by 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. 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.
 2. Temperature-Rise Limit: Where indicated and at exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than **450 deg F (250 deg C)** above ambient after 30 minutes of standard fire-test exposure.
 3. Smoke Control: Where indicated and in corridors and smoke barriers, provide doors that are listed and labeled with the letter "S" on the fire-rating label by a qualified testing agency for smoke- and draft-control based on testing according to UL 1784; with maximum air-leakage rate of **3.0 cfm/sq. ft. (0.01524 cu. m/s x sq. m)** of door opening at **0.10 inch wg (24.9 Pa)** for both ambient and elevated temperature tests.
- B. Sound-Control Doors: Assemblies tested in a laboratory for sound-transmission-loss performance according to ASTM E90, calculated according to ASTM E413, and rated for not less than the STC value indicated.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

- C. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" the ABA standards of the Federal agency having jurisdiction and ICC A117.1
 - D. Structural Performance, Exterior Doors: Capable of withstanding the following design wind loads:
 - 1. Design Wind Load: As indicated on Drawings, Uniform pressure (velocity pressure) of **20 lbf/sq. ft. (960 Pa)**, acting inward and outward.
 - 2. Testing: According to ASTM E330/E330M or DASMA 108 for garage doors and complying with acceptance criteria of DASMA 108.
 - 3. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.
 - 4. Operability under Wind Load: Design overhead coiling doors to remain operable under design and uniform pressure (velocity pressure) of **20-lbf/sq. ft. (960-Pa)** wind load, acting inward and outward.
 - E. Windborne-Debris Impact Resistance: Provide **glazed and impact-protective** overhead coiling doors that pass ASTM E1886 missile-impact and cyclic-pressure tests according to ASTM E1996 for Wind Zone 1, ASTM E1996 for Wind Zone 2, ASTM E1996 for Wind Zone 3, ASTM E1996 for Wind Zone 4, or DASMA 115 for basic enhanced protection.
 - 1. Large-Missile Test: For overhead coiling doors located within 30 feet (9.1 m) of grade.
 - 2. Small-Missile Test: For overhead coiling doors located between 30 feet (9.1 m) and 60 feet (18.3 m) above grade.
 - F. Seismic Performance: Overhead coiling doors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. Component Importance Factor: 1.5 or 1.0.
- 2.3 DOOR ASSEMBLY Refer to door schedule in drawings – Non-Fire Rated (Aluminum)
- A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.
 - 1. Clopay Building Products Company, which is located at: 8585 Duke Blvd. ASD; Mason, OH 45040-3101; Toll Free Tel: 800-526-4301 prompt #3; Fax: 888-434-3193; Email: CIA@clopay.com Web: www.clopaycommercial.com
 - 2. Or Approved Equal
 - B. Operation Cycles: Door components and operators capable of operating for not less than **50,000** . One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
 - 1. Include tamperproof cycle counter.
 - C. Air Infiltration: Maximum rate of 0.4 cfm/sq. ft. (2.03 L/s per sq. m) when tested according to ASTM E283.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

- D. STC Rating: 26
- E. Curtain R-Value: 4.5 deg F x h x sq. ft./Btu (0.792 K x sq. m/W)
- F. Door Curtain Material: Aluminum.
- G. Door Curtain Slats: Flat profile slats of 1-1/2-inch (38-mm) center-to-center height.
 - 1. Insulated-Slat Interior Facing: Aluminum.
 - 2. Gasket Seal. Manufacturer's standard continuous gaskets between slats.
- H. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch (38 by 38 by 3 mm) thick; fabricated from aluminum extrusions and finished to match door.
- I. Curtain Jamb Guides: Aluminum with exposed finish matching curtain slats.
- J. Pass Door(s): N/A
- K. Hood: Aluminum.
 - 1. Shape: Round
 - 2. Mounting: Face of wall and as indicated on Drawings.
- L. Locking Devices: Equip door with slide bolt for padlock.
 - 1. Locking Device Assembly: Cremone-type, both jamb sides locking bars, operable from inside with thumb turn .
- M. Manual Door Operator: Manufacturer's standard crank operator.
 - 1. Provide operator with through-wall shaft operation.
 - 2. Provide operator with manufacturer's standard removable operating arm.
- N. Electric Door Operator:
 - 1. Usage Classification: Medium duty, up to 12 cycles per hour and up to 50 cycles per day..
 - 2. Operator Location: Front of hood.
 - 3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet (2.44 m) or lower.
 - 4. Motor Exposure: Interior
 - 5. Motor Electrical Characteristics:
 - a. Horsepower: 1/2hp for 10'x10' door, 1hp for 20'x10' door (sizes approximate).
 - b. Voltage: 120v and 208v are available, single phase, 60 Hz.
 - c. Voltage: 120v and 208v are available, three phase, 60 Hz.
 - 6. Emergency Manual Operation: Crank type.
 - 7. Obstruction-Detection Device: Automatic electric sensor edge on bottom bar,
 - a. Sensor Edge Bulb Color: Black.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

8. Control Station(s): Interior mounted or where indicated on Drawings.
 9. Other Equipment:
- O. Curtain Accessories: Equip door with smoke seals, weather seals.
- P. Door Finish:
1. Aluminum Finish: Anodized color as selected by Architect from full range of industry colors and color densities.
 2. Baked-Enamel or Powder-Coated Finish: Matching Architect's sample. RAL 9001 Premium
 3. Factory Prime Finish: Manufacturer's standard color.
 4. Stainless Steel Finish: N/A
 5. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.
- 2.4 FIRE-RATED DOOR ASSEMBLY - Refer to Door schedule in the drawings
- A. Fire-Rated Insulated Service Door: Overhead fire-rated coiling door formed with curtain of interlocking metal slats.
1. Clopay Building Products Company, which is located at: 8585 Duke Blvd. ASD; Mason, OH 45040-3101; Toll Free Tel: 800-526-4301 prompt #3; Fax: 888-434-3193; Email: CIA@clopay.com Web: www.clopaycommercial.com
 2. Or Approved Equal
- B. Operation Cycles: Door components and operators capable of operating for not less than 50,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
1. Include tamperproof cycle counter.
- C. Fire Rating: 1 hour with temperature-rise limit and with smoke control.
- D. Air Infiltration: Maximum rate of 0.4 cfm/sq. ft. (2.03 L/s per sq. m) when tested according to ASTM E283.
- E. STC Rating: 27
- F. Curtain R-Value: **4.5 deg F x h x sq. ft./Btu (0.792 K x sq. m/W).**
- G. Door Curtain Material: Stainless steel.
- H. Door Curtain Slats: Flat profile slats of 1- ½ inch. center-to-center height.
1. Vision Panels:
 2. Insulated-Slat Interior Facing: Metal.
- I. Curtain Jamb Guides: Stainless steel with exposed finish matching curtain slats.
- J. Pass Door(s): N/A

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

- K. Hood: Match curtain material and finish.
 - 1. Shape: Square and as indicated on Drawings.
 - 2. Mounting: Face of wall or as indicated on Drawings.

- L. Locking Devices: Equip door with slide bolt for padlock.
 - 1. Locking Device Assembly: Cremone-type, both jamb sides locking bars, operable from inside with thumb turn.

- M. Manual Door Operator: Manufacturer's standard crank operator.
 - 1. Provide operator with through-wall shaft operation.
 - 2. Provide operator with manufacturer's standard removable operating arm.

- N. Electric Door Operator:
 - 1. Usage Classification: Medium duty, up to 12 cycles per hour and up to 50 cycles per day.
 - 2. Operator Location: Front of hood or as indicated on Drawings.
 - 3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet (2.44 m) or lower].
 - 4. Motor Exposure: Interior
 - 5. Motor Electrical Characteristics:
 - a. Horsepower: 1/2hp for 10'x10' door, 1hp for 20'x10' door (sizes approximate).
 - b. Voltage: 120v and 208v are available, single phase, 60 Hz.
 - c. Voltage: 120v and 208v are available, three phase, 60 Hz.
 - Emergency Manual Operation: Push-up or Crank type.
 - 6. Obstruction-Detection Device: Automatic electric sensor edge on bottom bar
 - a. Sensor Edge Bulb Color: Black
 - 7. Control Station(s): Interior mounted or where indicated on Drawings.
 - 8. Other Equipment: N/A

- O. Curtain Accessories: Equip door with smoke seals, automatic-closing device, push/pull handles or pull-down strap.

- P. Door Finish:
 - 1. Baked-Enamel or Powder-Coated Finish: AAMA 2605 powder coated color to be approved by Architect
 - 2. Factory Prime Finish: Manufacturer's standard color.
 - 3. Stainless Steel Finish: N/A
 - 4. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.5 MATERIALS, GENERAL

- A. 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.

2.6 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
1. Steel Door Curtain Slats: N/A
 2. Stainless Steel Door Curtain Slats: ASTM A666, Type 304; sheet thickness of **0.025 inch (0.64 mm)**; and as required.
 3. Aluminum Door Curtain Slats: **ASTM B209 (ASTM B209M)** sheet or **ASTM B221 (ASTM B221M)** extrusions, alloy and temper standard with manufacturer for type of use and finish indicated; thickness of **0.050 inch (1.27 mm)**; and as required.
 4. Vision-Panel Glazing: N/A
 5. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E84 or UL 723. Enclose insulation completely within slat faces.
 6. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face, with minimum steel thickness of **0.010 inch (0.25 mm)** and minimum aluminum thickness of **0.032 inch (0.80 mm)**.
 7. Plastic Interior Curtain-Slat Facing: N/A
- B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding wind locks.
- C. Pass Door(s): N/A

2.7 HOODS

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that project beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
1. Galvanized Steel: N/A
 2. Stainless Steel: **0.025-inch- (0.64-mm-)** thick, stainless-steel sheet, Type 304, complying with ASTM A666

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

3. Aluminum: **0.040-inch- (1.02-mm-)** thick aluminum sheet complying with **ASTM B209 (ASTM B209M)**, of alloy and temper recommended by manufacturer and finisher for type of use and finish indicated.
4. Include automatic drop baffle on fire-rated doors to guard against passage of smoke or flame.
5. Exterior-Mounted Doors: Fabricate hood to act as weather protection and with a perimeter sealant-joint-bead profile for applying joint sealant.

- B. Removable Metal Soffit: Formed or extruded from same metal and with same finish as curtain if hood is mounted above ceiling unless otherwise indicated.

2.8 LOCKING DEVICES

- A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.
- B. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
1. Lock Cylinders: As specified in Section 087100, standard with manufacturer and keyed to building keying system.
 2. Keys: Three for each cylinder.
- C. Chain Lock Keeper: Suitable for padlock.
- D. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.9 CURTAIN ACCESSORIES

- A. Smoke Seals: Equip each fire-rated door with replaceable smoke-seal perimeter gaskets or brushes for smoke and draft control as required for door listing and labeling by a qualified testing agency.
- B. Weatherseals for Exterior Doors: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.
1. At door head, use **1/8-inch- (3-mm-)** thick, replaceable, continuous-sheet baffle secured to inside of hood or field-installed on the header.
 2. At door jambs, use replaceable, adjustable, continuous, flexible, **1/8-inch- (3-mm-)** thick seals of flexible vinyl, rubber, or neoprene.
- C. Astragal for Interior Doors: Equip each door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.
- D. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.
- E. Pull-Down Strap: Provide pull-down straps for doors more than **84 inches (2130 mm)** high.

- F. Poll Hooks: Provide pole hooks and poles for doors more than **84 inches (2130 mm)** high.
- G. Automatic-Closing Device: Equip each fire-rated door with an automatic-closing device or holder-release mechanism and governor unit complying with NFPA 80 and an easily tested and reset release mechanism. Automatic-closing device shall be designed for activation by the following:
 - 1. Replaceable fusible links with temperature rise and melting point of **165 deg F (74 deg C)** interconnected and mounted on both sides of door opening.
 - 2. Manufacturer's standard UL-labeled smoke detector and door-holder-release devices.
 - 3. Manufacturer's standard UL-labeled heat detector and door-holder-release devices.
 - 4. Building fire-detection, smoke-detection, and -alarm systems.

2.10 COUNTERBALANCE MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than **0.03 in./ft. (2.5 mm/m)** of span under full load.
- C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
 - 1. Fire-Rated Doors: Equip with auxiliary counterbalance spring and prevent tension release from main counterbalance spring when automatic-closing device operates.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.11 MANUAL DOOR OPERATORS

- A. General: Equip door with manual door operator by door manufacturer.
- B. Push-up Door Operation: Lift handles and pull rope for raising and lowering doors, with counterbalance mechanism designed so that required lift or pull for door operation does not exceed **25 lbf (111 N)**.
- C. Chain-Hoist Operator: N/A
- D. Crank Operator: Consisting of crank and crank gearbox, steel crank drive shaft, and gear-reduction unit, of type indicated. Size gears to require not more than **25-lbf (111-N)** force to

turn crank. Fabricate gearbox to be oiltight and to completely enclose operating mechanism. Provide manufacturer's standard crank-locking device.

2.12 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
1. Comply with NFPA 70.
 2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door Operator Location(s): Operator location indicated for each door.
1. Top-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on top of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Headroom is required for this type of mounting.
 2. Front-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on coil side of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Front clearance is required for this type of mounting.
 3. Wall Mounted: Operator is mounted to the inside front wall on the left or right side of door and connected to door drive shaft with drive chain and sprockets. Side room is required for this type of mounting. Wall-mounted operator can also be mounted above or below shaft; if above shaft, headroom is required.
 4. Bench Mounted: Operator is mounted to the right or left door head plate and connected to the door drive shaft with drive chain and sprockets. Side room is required for this type of mounting.
 5. Through-Wall Mounted: Operator is mounted on other side of wall from coil side of door.
- D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated for each door assembly.
1. Electrical Characteristics: Minimum as indicated for each door assembly. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than **8 in./sec. (203 mm/s)** and not more than **12 in./sec. (305 mm/s)**, without exceeding nameplate ratings or service factor.
 2. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
 3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
- E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

- F. Obstruction-Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening For fire-rated doors, activation delays closing.
 - 1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
 - a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained or constant pressure on close button.
 - 2. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
 - a. Self-Monitoring Type: Four-wire-configured device designed to interface with door operator control circuit to detect damage to or disconnection of sensor edge.
 - 3. Pneumatic Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device.
- G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."
 - 1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
 - 2. Exterior-Mounted Units: Full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.
- H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed **25 lbf (111 N)**.
- I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
- K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with the accessibility standard.
- L. Portable Radio-Control System: N/A
 - 1. Three-channel universal coaxial receiver to open, close, and stop door.
 - 2. Portable control device to open and stop door may be momentary-contact type; control to close door shall be sustained- or constant-pressure type.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

3. Remote-antenna mounting kit.

2.13 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
- 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.

2.14 ALUMINUM FINISHES

- A. Powder-Coat Finish: AAMA 2605. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.15 STEEL AND GALVANIZED-STEEL FINISHES – N/A

2.16 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.
 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 3. Directional Satin Finish: ASTM A480/A480M No. 4.
- C. Bright, Cold-Rolled, Unpolished Finish: ASTM A480/A480M No. 2B.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install overhead coiling doors, hoods, controls, and operators at the mounting locations indicated for each door.
- C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with the accessibility standard.
- D. Fire-Rated Doors: Install according to NFPA 80.
- E. Smoke-Control Doors: Install according to NFPA 80 and NFPA 105.
- F. Power-Operated Doors: N/A

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and to furnish reports to Architect.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Test door release, closing, and alarm operations when activated by smoke detector or building's fire-alarm system. Test manual operation of closed door. Reset door-closing mechanism after successful test.
 - 2. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, section 5.2.
- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.4 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.
 - 2. After electrical circuitry has been energized, operate doors to confirm proper motor rotation and door performance.
 - 3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

3.5 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
 - 1. Adjust exterior doors and components to be weather resistant.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide tight fit around entire perimeter.

3.6 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include six months' full maintenance by skilled employees of coiling-door Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 1. Perform maintenance, including emergency callback service, during normal working hours.
 - 2. Include 24-hour-per-day, seven-day-per-week, emergency callback service.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 083323

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SECTION 08 51 13 – ALUMINUM WINDOWS

PART 1 – GENERAL

1.1 RELATED SECTIONS

- A. Glass and glazing – Section 08 80 00
- B. Sealants and caulking – Section 07 92 00

1.2 SUMMARY

- A. Section includes:
 - 1. Operable Heavy Commercial Grade and Architectural Window Grade Aluminum Projected Windows in Cross Axis Restroom.

1.3 REFERENCES

- A. American Architectural Manufacturers Association (AAMA).
- B. American Society for Testing Materials (ASTM).
- C. American National Standards Institute (ANSI)

1.4 TEST AND PERFORMANCE REQUIREMENTS

- A. Provide aluminum window system designed to accommodate expansion and contraction due to normal thermal movement and wind loading per manufacturer's window test reports. Establish basic dimension of units, sight lines, and profiles of members according to the performance requirements.
 - 1. In order to designate quality of materials and workmanship required, these specifications are based upon products from Boyd Aluminum Manufacturing Co., Inc. Springfield, MO (800) 737-2800.
 - 2. Products of other manufacturers equal to or exceeding those specified herein will be considered upon written authorization by the Architect. Information, including window sample (size and configuration per Architect's requirements) must be submitted for consideration a minimum of 10 days before project bid date.
- B. Test Criteria: Testing shall be performed by an AAMA qualified independent testing agency and be based on the following criteria:
 - 1. Current test reports must be submitted and be AAMA certified to be accepted.
- C. Performance Requirements: Test reports must show compliance with AAMA/WDMA/CSA 101/I.S.2/A440-08 for AW-PG90.
 - 1. Air-Infiltration: Shall not exceed 0.05 cfm/ft of sash crack per ASTM E283 at a differential static pressure of 6.2 psf.
 - 2. Water Infiltration: No uncontrolled leakage per ASTM E331 at a test pressure of 15.00 psf.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

3. Uniform Load deflection: No framing member shall deflect more than $L/175$ and maximum deformation of any member shall not exceed 0.2 percent, per ASTM E330.
4. Structural Requirements: Maximum permanent deformation of any component shall not exceed 0.4 percent at a test pressure of 120.00 psf as defined per ASTM E330.
5. Forced-Entry Resistance: Comply with Performance Level 10 requirements when tested according to ASTM F 588.
6. Windborne-Debris Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone 3 for basic protection.

1.5 SUBMITTALS

- A. General: Submit in accordance with Division 1.
- B. Product Data: Submit for windows
 1. Include information for factory finishes, glass, glazing components, accessories, and other required components.
 2. Include information on hardware and operators.
 3. Submit certified test reports from AAMA accredited laboratories verifying all performance requirements specified herein.
- C. Shop Drawings: Indicate elevations, detailed design, dimensions, member profiles, joint locations, arrangement of units, and member connections.
 1. Anchorage system.
 2. Interfacing with building constructions.
 3. Full-size details of special and typical shapes.
 4. Indicate glazing details and sealant requirements.
 5. Show finishes indicating compliance with the specifications.
 6. Indicate recorded field measurements on final drawings as available.
- D. Samples: Indicate quality of finish on alloys used, 12 inches long for extrusions and 6 inches square for sheet materials.
 1. Where normal texture or color variations are expected, include additional samples illustrating range of variation.
- E. Samples of Verification: Submit samples of anchors, fasteners, hardware, assembled corner sections, and other materials and components if requested by the architect.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Certified in writing that installer has experience on at least five projects of similar nature in past five years. The installer shall warrant the satisfactory performance of the window installation which includes, but is not limited to, installation accessories (glazing, perimeter sealing), and anchorage as called for by the specifications and approved shop drawings

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

- B. Single Source Responsibility: Provide window units manufactured by one manufacturer
 - 1. Glass and glazing for window units are required as work of this section for single source responsibility. Factory glaze units.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver units pre-glazed with manufacturer's labels intact on interior side of glass.
- B. Protect glass and glazing to prevent chipping, cracking, and other similar damages.
- C. Store windows in upright position, off ground.
- D. Protect finished surfaces to prevent damage.
- E. Do not use adhesive papers or sprayed coatings which become firmly bonded when exposed to sun.
- F. Do not leave coating residue on surfaces.
- G. Protect the window units from lime, mortar, runoff from concrete and copper, careless handling of tools, weld platter, acids, roofing tar, solvents, abrasive cleaners, and other items that could damage the window units.

1.8 WARRANTY

- A. Warranty: The window manufacturer shall provide a written warranty that window units are free from defective materials or workmanship within a specified period. Failures include the following:
 - 1. Materials defect in manufacture.
 - 2. Faulty operation of sash and hardware.
- B. Warranty Period: 2-year after delivery of product
- C. Warranty Period for Glass: 5-years after delivery of product

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Boyd Aluminum Manufacturer Co. Inc., Springfield, MO (800) 737-2800.
 - 1. Series 2300 Project-Out Window
- B. Diamond Windows & Doors MFG Inc., Dorchester, MA (617) 282-1688.
 - 1. Steel Replica (5000 Series)
- C. Subject to compliance with Section 1.4 manufacturers offering equal products may be incorporated in the work.

2.2 MATERIALS

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

- A. Aluminum extrusions shall comply with ASTM B 221 and tolerances shall be in accordance with the Aluminum Association's "Drafting Standards for Aluminum Extruded and Tubular Products". Extrusions shall not be less than a nominal 0.125 inch thick for main frame and sash members, and a minimum of 0.050 inch at glazing stops. Sheet shall comply with ASTM B 209, alloy and temper recommended by manufacturer appropriate for specified finish.
- B. Fasteners: Provide stainless steel fasteners, corrosion resistant and compatible with aluminum.
 - 1. Reinforcement: When fasteners screw into aluminum less than a nominal .062 inch thick, utilize nuts or washers of design having means to reinforce interior aluminum surfaces and prevent disengagement.
 - 2. Exposed Fasteners: Provide concealed fasteners wherever possible.
- C. Shims: Non-staining and non-ferrous type.
- D. Glazing tape: Blend of polyisobutylene and butylpolymer complying with AAMA 807.3-92
- E. Sealants: The color of the sealant exposed with the window in the closed position shall be chosen from the manufacturer's standards. If unspecified, the sealant color shall be compatible with the window framing materials.
 - 1. Non-working joints: Sealant shall comply with AAMA 800.
 - 2. Window Components: Sealant shall be suitable for application specified and approved by the window manufacturer.
 - 3. Perimeter: Sealant shall comply with AAMA 800 and Section 0900.
- F. Insect Screen: Provide 18 by 16 mesh of 0.013 inch diameter, coated aluminum wire, complying with FS RR-W-365.
- G. Compression Type Gaskets: Provide compressible TPE stripping for glazing and weather stripping complying with ASTM D 1921, ASTM D 792, ASTM D 2240, ASTM D 412, ASTM D 590, and ASTM D 3835 molded TPE gaskets.

2.3 ACCESSORIES

- A. Insect Screens:

Provide insect screens for each operable sash. Screens shall be tight-fitting, removable and have no exposed fasteners.

 - 1. Screen Frames: Frames shall be of extruded tubular shaped aluminum, with a minimum wall thickness of .050 inch, have mitered joints, and corners secured by concealed corner keys. Finish frames to match windows.
 - 2. Screen frames must rest into integral extruded channels on main frame, at both jambs and sill. Screens attached by means of exposed fasteners are not acceptable. No part of screen may protrude past the face of main frame with the exception of screens utilizing wickets.
 - a. Provide removable extruded vinyl spline at edge of screening.
 - 3. Wickets: Provide hinged-type wickets, when required to accommodate hardware, framed and trimmed for a tight fit.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

- B. Muntins: Provide muntins in each designated sash to replicate the desired divided lite configuration. Muntins shall be of extruded or roll-formed aluminum. Muntins shall be rectangular or contour in shape, per architect's request.
 - 1. True divided lite muntins: Provide an extruded aluminum muntin with a minimum nominal wall thickness of 0.125 inch. Finish to match windows.
- C. Mullions: Provide extruded aluminum mullions with a minimum nominal wall thickness of .062 inch and cover plates, where required, to complete window to window connections.
- D. Receptors: Provide two piece extruded aluminum receptors for the head and/or jambs of the window openings with a minimum nominal wall thickness of .062 inch. Provide one row of TPE gasket placed into extruded grooves in each receptor piece to ensure no window unit to receptor metal contact. Provide receptors with integral nailing fin, if required by the architect. Finish receptors to match windows.
- E. Subsills: Provide subsills with a minimum nominal wall thickness of .062 inch. Provide subsills with means to weep water to the exterior. Finish subsills to match windows.
- F. Panning: Provide extruded aluminum panning of the type and configuration required by the architect with a minimum nominal wall thickness of .062 inches. Provide one row of vinyl gasket placed into extruded grooves in each panning member to ensure no window unit to panning members. Clips shall be attached with stainless steel fasteners. Space stainless steel clips appropriately to allow the window units to secure themselves tightly to the panning. Window units shall lip over the panning sill member allowing water to weep to the exterior. Finish panning to match window units.
- G. Trims: Provide extruded aluminum trim of the type and configuration required by the architect with a minimum nominal wall thickness of .050 inches. Provide extruded aluminum trim clips, with a minimum nominal wall thickness of .050 inch, to allow attachment of the trim to the window units and/or openings. Finish trim to match window units.

2.4 PROJECT-OUT WINDOWS

- A. Window Grade and Class: Comply with requirements of AAMA Grade and Performance Class for both AW-PG90. Window units shall successfully pass operating force test performance requirements specified in AAMA 101.
 - 1. Provide window units with a 2 3/8" minimum main frame depth.
 - 2. Provide 1 1/2" maximum overall glazing thickness. See Section 08800 glass and glazing.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

- B. Hardware:
 - 1. Four-Bar Friction Hinges of stainless steel construction and nonabrasive friction shoe complying with AAMA 904.1.
 - 2. Gear-type rotary operator. Provide crank-type operator on each gear box shaft, with removable crank. Where necessary, extend crank shaft with universal joints and support brackets to a suitable crank-mounting location.
- C. Glazing Gaskets: Provide sliding-type gaskets.
 - 1. Provide TPE gaskets placed into extruded grooves in glazing stop.
 - a. Provide one row of TPE gasket at all glazing stops.
- D. Weatherstripping Gaskets: Provide sliding-type gaskets.
 - 1. Provide TPE gaskets placed into extruded grooves in sash members.
 - a. Provide two rows of TPE gaskets at all sash members.

2.5 FABRICATION

- A. Fabricate components in accordance with manufacturer's tested assemblies. Remove burrs and ease edges. Shop fabricate to greatest extent practicable to minimum field assembly. Disassemble only to the extent necessary for shipping and handling limitations.
- B. Thermal Break: Manufacturer's standard integral urethane thermal barrier, located between exterior and interior members to provide thermal separation. Provide thermal break that has been tested for thermal conductance and has been in use a minimum of 5 years.
- C. Weep System: Provide drain system to evacuate water entering joints occurring within windows.

2.6 FINISHES

- A. Fluorocarbon, High Performance Paint Coating: Color as selected from manufacturer's full range of colors by architect. Fluorocarbon spray coating shall be applied by a licensed applicator and shall meet AAMA 2605-98 specifications.
 - 1. Fluorocarbon 3-coat System: Inhibitive primer, fluoropolymer color coating, and clear fluoropolymer top coating complying with AAMA 2605-98 Fluoropolymer color and clear coats shall not have less than 70 percent polyvinylidene fluoride. Prepare and pre-treat metal surfaces to comply with paint manufacturer's instructions.

PART 3 – EXECUTION

3.1 INSPECTION

- A. Remove and properly dispose of existing windows in accordance with Section 02070. Verify that openings are dimensionally within allowable tolerances, plumb, level, and clean. Provide solid anchoring surfaces that are in accordance with approved shop drawings.
- B. Verify that the opening into which the windows will be installed is the correct size to permit installation of the new windows according to the manufacturer's installation instructions.
- C. Do not install windows until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Install windows with skilled tradesperson in exact accordance with approved shop drawings.
- B. Aluminum that is not organically coated shall be insulated from direct contact with steel, masonry concrete or noncompatible materials by bituminous paint, zinc chromate primer, or other suitable insulating material.
- C. Install vapor retardant tape between window perimeter and adjoining collateral materials and existing wall barriers to insure continuity.
- D. Plumb and align window faces in a single plane for each wall plane. Erect square and true. Anchor to maintain position when subjected to normal thermal and building movement (seismic forces), and specified wind loads.
- E. Install glass and glazing in accordance with approved shop drawings to provide satisfactory, leak-free installation.
- F. Perimeter Sealing: Seal joints at the perimeters in accordance with approved shop drawings to provide watertight installation.
 - 1. Joints and surfaces to receive sealants shall be clean, free from loose material, free of effervescence or mortar leaking, and dry. Sealants shall not be applied when the temperature is below the sealant manufacturer's instructions.
 - 2. Clean the joints and surfaces before sealing or priming. Then prime the joints in accordance with the sealant manufacturer's instructions.
 - 3. Provide joint backing in all joints where a suitable backer to receive sealant is otherwise not available. Joint depth shall be equal to $\frac{1}{2}$ of the width.
 - 4. Caulk joint width shall not be less than $\frac{1}{4}$ inch not more than $\frac{1}{2}$ inches unless otherwise recommended by the sealant manufacturer. Wipe off the excess material and leave the exposed surfaces and joints clean and smooth.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

3.3 ADJUSTING

- A. After installation, windows and glazing shall be inspected and adjusted to provide smooth operation and a weathertight window system.

3.4 CLEANING

- A. After installation, leave windows clean and free of temporary labels and dirt. Protect finished installation against damage.
- B. Final cleaning of the anodized finish shall be in accordance with AAMA 690.1.
- C. Final cleaning of the painted finish shall be in accordance with AAMA 610.1.

END OF SECTION 08 51 13

SECTION 085413 - FIBERGLASS WINDOWS

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 fiberglass-framed windows. Refer to drawings for window type.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Playland Park, RYE, New York.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review, discuss, and coordinate the interrelationship of fiberglass windows with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.
 - 3. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
 - 4. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for fiberglass windows.
- B. Shop Drawings: For fiberglass windows.
 - 1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
- C. Samples: For each exposed product and for each color specified, **2 by 4 inches (50 by 100 mm)** in size.
- D. Samples for Initial Selection: For units with factory-applied finishes.
 - 1. Include Samples of hardware and accessories involving color selection.

- E. Samples for Verification: For fiberglass windows and components required, prepared on Samples of size indicated below:
 - 1. Exposed Finishes: **2 by 4 inches (50 by 100 mm)**
 - 2. Exposed Hardware: Full-size units.
- F. Product Schedule: For fiberglass windows. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.
- B. Product Test Reports: For each type of fiberglass window, for tests performed by a qualified testing agency.
- C. Field quality-control reports.
- D. Sample Warranties: For manufacturer's warranties.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating fiberglass windows that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.
- B. Installer Qualifications: An installer acceptable to fiberglass window manufacturer for installation of units required for this Project.
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace fiberglass windows that 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, and air infiltration.
 - c. Faulty operation of movable sash and hardware.

- d. Deterioration of materials and finishes beyond normal weathering.
 - e. Failure of insulating glass.
2. Warranty Period:
- a. Window: 10 years from date of Substantial Completion.
 - b. Glazing Units: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain fiberglass windows from single source from single manufacturer.
 - 1. Pella(R)

2.2 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
 - 1. Window Certification: WDMA certified with label attached to each window.
- B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
 - 1. Minimum Performance Class: CW and as indicated on Drawings.
 - 2. Minimum Performance Grade: 30 and as indicated on Drawings.
- C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of **0.30 Btu/sq. ft. x h x deg F (1.71 W/sq. m x K)**.
- D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.27.
- E. Sound Transmission Class (STC): Rated for not less than 30 STC when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E413.
- F. Outside-Inside Transmission Class (OITC): Rated for not less than 30 OITC when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E1332.
- G. Windborne-Debris Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone [1] [2] [3] [4] for [**basic**] [**enhanced**] protection.
 - 1. Large-Missile Test: For glazing located within **30 feet (9.1 m)** of grade.
 - 2. Small-Missile Test: For glazing located between 30 feet (9.1 m) and **60 feet (18.3 m)** above grade.

2.3 FIBERGLASS WINDOWS

- A. Impervia(R) Windows. Operating Types: Provide the following operating types in locations indicated on Drawings:
 - 1. Awning: Project out.
- B. Frames and Sashes: Pultruded fiberglass complying with AAMA/WDMA/CSA 101/I.S.2/A440 and with exposed exterior fiberglass surfaces finished with manufacturer's standard enamel coating complying with **AAMA 613, AAMA 623**.
 - 1. Exterior Color: Black
 - 2. Interior Finish: Matching exterior color and finish.
 - 3. Retain "Glass," "Windborne-Debris-Impact-Resistant Laminated Glass," "Insulating-Glass Units," or "Windborne-Debris-Impact-Resistant Insulating-Glass Units" Paragraph below to suit Project or revise if other type of glazing unit is necessary.
- C. Glass: Clear annealed glass, ASTM C1036, Type 1, Class 1, q3.
 - 1. Kind: Fully tempered
- D. Windborne-Debris-Impact-Resistant Laminated Glass: ASTM C1172 with two plies of float glass.
 - 1. Float Glass: Annealed or as required by performance requirements.
 - 2. Inner Ply: Clear.
 - 3. Interlayer: **0.090 inch (2.29 mm)** As required by performance requirements .
 - 4. Outer Ply: Clear
 - 5. Low-E Coating: Pyrolytic on second surface.
- E. Insulating-Glass Units: ASTM E2190.
 - 1. Glass: ASTM C1036, Type 1, Class 1, q3.
 - a. Tint: Clear.
 - b. Kind: Fully tempered.
 - 2. Lites: Two.
 - 3. Filling: Fill space between glass lites with argon.
 - 4. Low-E Coating: Pyrolytic on second surface.
 - 5. Integral Louver Blinds: N/A
- F. Windborne-Debris-Impact-Resistant Insulating-Glass Units: ASTM E2190 with two lites and complying with impact-resistance requirements in "Window Performance Requirements" Article.
 - 1. Exterior Lite: ASTM C1036, Type 1, Class 1, q3.
 - a. Tint: Clear
 - b. Kind: Fully tempered

2. Interior Lite: ASTM C1172 clear laminated glass with two plies of float glass.
 - a. Float Glass: Annealed
 - b. Interlayer Thickness: 0.090 inch (2.29 mm)
 3. Filling: Fill space between glass lites with argon.
 4. Low-E Coating: Pyrolytic on second surface
- G. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal
- H. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock fiberglass windows, and sized to accommodate sash weight and dimensions.
1. Exposed Hardware Color and Finish: Black to match frame.
- I. Projected Window Hardware:
1. Gear-Type Rotary Operators: Complying with AAMA 901 when tested according to ASTM E405, Method A. Provide operators that function without requiring the removal of interior screens or using screen wickets.
 - a. Type and Style: As selected by Architect from manufacturer's full range of types and styles.
 2. Hinges: Manufacturer's standard type for sash weight and size indicated.
 3. Single-Handle Locking System: Operates positive-acting arms that pull sash into locked position. Provide one arm on sashes up to 27-1/2 inches (700 mm) tall and two arms on taller sashes.
 4. Limit Devices: Concealed friction adjustor, adjustable stay bar limit devices designed to restrict sash opening.
 - a. Limit clear opening to 4 inches (100 mm) for ventilation; with custodial key release.
 5. Pole Operators: Tubular-shaped anodized aluminum; with rubber-capped lower end and standard push-pull hook at top to match hardware design; of sufficient length to operate window without reaching more than 60 inches (1500 mm) above floor; one pole operator and pole hanger per room that has operable windows more than 72 inches (1800 mm) above floor.
- J. Hung Window Hardware:
1. Counterbalancing Mechanism: Complying with AAMA 902, concealed, of size and capacity to hold sash stationary at any open position.
 2. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only. Provide custodial locks.
 3. Tilt Hardware: Releasing tilt latch allows sash to pivot about horizontal axis to facilitate cleaning exterior surfaces from the interior.

- K. Horizontal-Sliding Window Hardware:
 - 1. Sill Cap/Track: Manufacturer's standard of dimensions and profile indicated; designed to comply with performance requirements indicated and to drain to the exterior.
 - 2. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only. Provide custodial locks.
 - 3. Roller Assemblies: Low-friction design.
- L. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
- M. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
 - 1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.4 ACCESSORIES

- A. Dividers (False Muntins): Provide divider grilles in designs indicated for each sash lite.
 - 1. Quantity and Type: One permanently located between insulating-glass lites.
 - 2. Material: Manufacturer's standard
 - 3. Pattern: As indicated on Drawings
 - 4. Profile: As selected by Architect from manufacturer's full range
 - 5. Color: Color to match sash
- B. Jamb Extensions: As selected by Architect from manufacturer's full range
- C. Insert requirements for mullion covers and trim pieces, such as brick molds, if needed.

2.5 INSECT SCREENS

- A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.
 - 1. Type and Location: Full, inside for project-out sashes.
- B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.
 - 1. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.
 - 2. Finish for Interior Screens: Baked-on organic coating in color selected by Architect from manufacturer's full range.
 - 3. Finish for Exterior Screens: Baked-on organic coating in color selected by Architect from manufacturer's full range.
- C. Glass-Fiber Mesh Fabric: **18-by-14 (1.1-by-1.4-mm) or 18-by-16 (1.0-by-1.1-mm) 20-by-20 (0.85-by-0.85-mm) or 20-by-30 (0.85-by-0.42-mm)** mesh of PVC-coated, glass-fiber threads;

woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration. Comply with ASTM D3656/D3656M.

1. Mesh Color: Black

D. Aluminum Wire Fabric: 18-by-16 (1.1-by-1.3-mm) mesh of 0.011-inch- (0.28-mm-) diameter, coated aluminum wire.

1. Wire-Fabric Finish: Black

2.6 FABRICATION

A. Fabricate fiberglass windows in sizes indicated. Include a complete system for installing and anchoring windows.

B. Glaze fiberglass windows in the factory.

C. Weather strip each operable sash to provide weathertight installation.

D. Mullions: Provide mullions and cover plates, 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. Provide mullions and cover plates capable of withstanding design wind loads of window units.

E. N/A

F. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

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 the Work.

B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.

C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E2112.
- B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
 - 1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.
- B. Testing Services: Testing and inspecting of installed windows shall take place as follows:
 - 1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AAMA 502.
 - 2. Air-Infiltration Testing:
 - a. Test Pressure: That required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance class indicated.
 - b. Allowable Air-Leakage Rate: 1.5 times the applicable AAMA/WDMA/CSA 101/I.S.2/A440 rate for product type and performance class rounded down to one decimal place.
 - 3. Water-Resistance Testing:
 - a. Test Pressure: Two-thirds times test pressure required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance grade indicated.
 - b. Allowable Water Infiltration: No water penetration.
 - 4. Testing Extent: Three mockup windows of each type as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested after perimeter sealants have cured.
 - 5. Test Reports: Prepared according to AAMA 502.
- C. Windows will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.4 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.

- B. Clean exposed surfaces immediately after installing windows. Remove excess sealants, glazing materials, dirt, and other substances.
 - 1. Keep protective films and coverings in place until final cleaning.
- C. Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.
- D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION 085413

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SECTION 08 62 10 - STEEL SASH WINDOW RESTORATION

PART 1 – GENERAL

1.1 SUMMARY

- A. Work included under this section is the complete restoration of existing steel windows and frames.
- B. Work includes removal of window units, repair and refinishing in the shop, and reinstallation in building openings. All Work will match existing historic details.
- C. Steel windows have historically been coated with lead base paint (LBP). The testing, removal and proper disposal of such paint shall be the responsibility of a certified Lead Paint Contractor.
- D. All glazing shall be replaced with new 1/4" laminated safety glass.

1.2 SUBMITTALS

- A. Evidence of required experience in steel window restoration.
- B. Written Restoration Plan describing methods, materials, and sequencing of the work.
 - 1. Written description of all damage and methods and techniques of repair.
 - 2. Proposed methods for remediation of LPB, if applicable.
 - 3. For windows being restored in situ:
 - a. Environmental factors affecting work, and methods proposed to ensure construction within appropriate environmental conditions.
 - b. Proposed phasing and timing of the work including coordination with progress of adjacent restoration work.
 - c. Methods of protection for surrounding construction and exterior vegetated areas and soils.
- C. Shop Drawings and Drawings for the historical record:
 - 1. Prior to beginning work, drawings depicting the dimensions of each window unit, the profiles of frames, mullions, muntins, etc, and identifying the locations of damage to be repaired or parts to be replaced.
 - 2. After the work has been performed, Provide as-built drawings to indicate the work performed on each window unit.
- D. Samples and product literature for A/E approval:
 - 1. Glazing: Three (3) 6" x 6" samples
 - 2. Glazing compound:
 - a. Manufacturer's product literature.
 - b. Compatibility certificate.

3. Weatherstripping, if applicable:
 - a. Manufacturer's product literature.
 - b. Weather stripping samples as requested.
 4. Replacement hardware and accessories:
 - a. Manufacturer's product literature.
 - b. Samples to verify compatibility with existing window operation and detail.
 5. Caulking:
 - a. Manufacturer's product literature.
 - b. Color samples for color selection.
 6. Chemical Stripper:
 - a. Manufacturer's product literature.
 - b. Testing result from field test, verifying that substrate is suitably prepared for paint system.
 7. Paint
 - a. Manufacturer's product literature for both primer and finish paint.
 - b. Samples for selection of color and sheen.
 - c. Samples of each finish paint on substrate matching window material.
- E. Mockup, as requested by the A/E:
1. Completed restoration of one (1) window to demonstrate aesthetic effects and set quality standards for material and execution.
 2. Do not begin remaining restoration work until mock-up is approved.
 3. Approved mockup may be incorporated into the work.

1.3 QUALITY ASSURANCE

- A. The work of this section shall be conducted by a firm with not less than five (5) years of successful experience in window restoration work similar to the historic restoration work indicated.

1.4 DEFINITION

- A. In-Kind: Replacement material to match original in detail and design in every way; new material to match adjacent existing materials.

1.5 JOB CONDITIONS

- A. Do not proceed with any portion of the Work outlined until unsatisfactory conditions have been corrected in a manner acceptable to the applicator.

- B. Notify Owner about anticipated problems and request direction.

PART 2 PRODUCTS

2.1 GLASS

- A. Provide ¼” laminated safety glass.

2.2 HARDWARE AND ACCESSORIES

- A. Identify missing or damaged hardware, including but not limited to, latches, hinges, hold opens, trims and accessory profiles. Salvage all hardware and accessories for repair, cleaning, and reinstallation at original location.
- B. Contractor shall repair all hardware into working condition. If hardware cannot be made to operate as original or hardware is missing, contractor shall provide replica hardware to match existing in-kind in every regard. For any custom fabrications provide attic stock of 5% but not less than one piece.

2.3 CHEMICAL STRIPPERS

- A. Dumont Chemicals, Inc., Peel Away 1 for removal of lead base paint.

2.4 GLAZING COMPOUND

- A. Utilize a glazing compound formulated for installation with metal windows.
 - 1. AllPro Corporation Glazing Compound for metal window frames or approved equal.
 - 2. DAP 1012 Glazing Compound or approved Equal.

2.5 WEATHERSTRIPPING

- A. Weatherstripping may include but is not limited to, as appropriate:
 - 1. Bronze spring metal with integral friction fit mounting.
 - 2. Vinyl strip “V” shape with adhesive attachment.
 - 3. Sealant bead set with bond breaker tape to the operable sash.
- B. Apply weather stripping following final paint operation.
- C. Coordinate final selection and installation of weatherstripping using a test window in the field.

2.6 PAINT

- A. Provide three-coat paint system. Obtain all products from a single manufacturer.
- B. Paint system to be Tnemec or approved equal, optimized for
 - 1. Bonding to substrate.
 - 2. Corrosion-inhibiting properties.
 - 3. Durability of aesthetic effect.

2.6 MISCELLANEOUS MATERIALS

- A. Primers, Sealers and Filling Compound and caulking. Provide materials needed to complete the Work specified.

PART 3 - EXECUTION

3.1 RESTORATION SEQUENCE

- A. The restoration work of this project includes, but is not limited to, the following:
 1. Remove existing glazing and glazing putty.
 2. Removal of surface rust, flaking and existing paint finish on all surfaces interior and exterior.
 3. Prepare existing steel window frames for new paint finish. Comply with SSPC standards for surface preparation as required for the approved finish paint system.
 4. Prime with approved primer.
 5. Remove and replace damaged and deteriorating screws and fasteners; replace missing screws and fasteners.
 6. Install new glazing to window frames.
 7. Install new glazing putty.
 8. Finish paint steel window frames.
 9. Clean and lubricate hinges and operating (movable) parts.
 10. Clean glazing (interior and exterior).
 11. Install windows as indicated in the drawings.

3.2 PREPARATION

- A. Remove all existing glass from steel window frame.
- B. Remove existing window putty in its entirety.
- C. Remove caulking from window frame and surrounding frame in its entirety.

3.3 STEEL FRAME PREPARATION

- A. Remove existing paint finish to expose bare steel frame typically. Use a chemical paint remover as specified.
 1. Do not use Hydrochloric acid.
- B. Rinse treated surfaces with running water to remove chemical residue and immediately dry treated surfaces with clean cotton disposable rags.
- C. Wipe bare metal using cleaning solvent as recommended by the chemical cleaner and dry surfaces immediately.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

- D. Remove rust and staining with a wire brush and/or electric wire brush. Sand surfaces smooth with aluminum oxide sandpaper. Hand sand edges as required.
- E. Following cleaning: Patch small holes and uneven areas with a steel based epoxy recommended for metal repair and patching.
- F. Sand edges smooth and even to adjacent frame surfaces.
- G. Verify that surface complies with the requirements of the primer and paint manufacturer.
- H. Prime exposed steel immediately following drying operations in accordance with manufacturer's written instructions. 3.4 GLAZING, FINISHING and INSTALLING
- A. Install new glazing to steel window frames using a glazing compound formulated for installation with metal windows.
 - 1. Cure glazing compound in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability.
- B. Apply paint finish coats in accordance with manufacturer's written instructions.
- C. Secure windows in openings as indicated in the drawings.
- D. Examine each window and repair any damage to paint finish incurred during installation.
- E. Install sealant at perimeter of window frames and adjacent wall finish surfaces. Use elastomeric compound compatible with field conditions:
 - 1. Insure sealant is compatible with field conditions. Use backer rod as appropriate.
 - 2. Use paintable sealant or colored sealant as selected by the A/E.
 - 3. Sealant shall be UV resistive with a durability of ten (10) years in application conditions encountered.
 - 4. Cure sealant in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability.

3.5 PROTECTION AND CLEANING

- A. Protect adjacent surfaces, both exterior and interior from the Work of this Contract.
- B. Protect glass from breakage immediately upon installation by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass.
- C. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.
- D. Maintain glass in a reasonably clean condition during construction so that it will not be damaged by corrosive action and will not contribute (by wash-off) to deterioration of glazing materials and other work.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

- E. Wash and polish glass not more than four (4) days prior to the date scheduled for inspection intended to establish date of substantial completion of the project. Comply with glass manufacturer's recommendations for final cleaning.
- F. Touch-up paint finish surfaces as required prior to the date scheduled for inspection intended to establish date of substantial completion of the project.
- G. Clean, dust, and leave adjacent work area of the window in a clean and neat manner.

END OF SECTION 086210

SECTION 087100 - DOOR HARDWARE

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 commercial door hardware for the following:
1. Swinging doors.
 2. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
1. Mechanical door hardware.
 2. Cylinders specified for doors in other sections.
- C. Related Sections:
1. Division 06 Section “Rough Carpentry”.
 2. Division 06 Section “Finish Carpentry”.
 3. Division 08 Section “Hollow Metal Doors and Frames”.
 4. Division 08 Section “Flush Wood Doors”.
- 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. ICC/IBC - International Building Code.
 3. NFPA 70 - National Electrical Code.
 4. NFPA 80 - Fire Doors and Windows.
 5. NFPA 101 - Life Safety Code.
 6. NFPA 105 - Installation of Smoke Door Assemblies.
 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
1. ANSI/BHMA Certified Product Standards - A156 Series.
 2. UL10C - Positive Pressure Fire Tests of Door Assemblies.

3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Warranty information for each product.
 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- D. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
- C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
- F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.
- G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
 1. Function of building, purpose of each area and degree of security required.
 2. Plans for existing and future key system expansion.
 3. Requirements for key control storage and software.
 4. Installation of permanent keys, cylinder cores and software.
 5. Address and requirements for delivery of keys.

- H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
 - 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 - 3. Review sequence of operation narratives for each unique access controlled opening.
 - 4. Review and finalize construction schedule and verify availability of materials.
 - 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- I. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 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 Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 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 and Frame Preparation: 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.

1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner 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 Owner. 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. Five years for exit hardware.
 - 3. Twenty five years for manual overhead door closer bodies.

1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

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.
- B. 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:
 - 1. 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.
- C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

- A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
1. Quantity: Provide the following hinge quantity:
 - 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 or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
 4. Hinge Options: Comply with the following:
 - a. Non-removable Pins: With the exception of electric through wire hinges, 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 all out-swinging lockable doors.
 5. Manufacturers:
 - a. Bommer Industries (BO).
 - b. Hager Companies (HA).
 - c. McKinney (MK).

2.3 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.
1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
 2. Furnish dust proof strikes for bottom bolts.
 3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
 4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

5. Manufacturers:
 - a. Door Controls International (DC).
 - b. Rockwood (RO).
 - c. Trimco (TC).

2.4 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.
- C. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
 1. Threaded mortise cylinders with rings and cams to suit hardware application.
 2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
 4. Tubular deadlocks and other auxiliary locks.
 5. 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.
 6. Keyway: Match Facility Standard.
- D. Removable Cores: Provide removable cores as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.
- E. Patented Cylinders: ANSI/BHMA A156.5, Grade 1 Certified Products Directory (CPD) listed cylinders employing a utility patented and restricted keyway requiring the use of a patented key. Cylinders are to be protected from unauthorized manufacture and distribution by manufacturer's United States patents. Cylinders are to be factory keyed with owner having the ability for on-site original key cutting.
 1. Patented key systems shall not be established with products that have an expired patent. Expired systems shall only be specified and supplied to support existing systems.
 2. Manufacturers:
 - a. Sargent (SA) - Degree DG1.
 - b. No Substitution.
- F. Keying System: Each type of lock and cylinders to be factory keyed.
 1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 3. Existing System: Field verify and key cylinders to match Owner's existing system.

- G. Key Quantity: Provide the following minimum number of keys:
1. Change Keys per Cylinder: Three (3).
 2. Master Keys (per Master Key Level/Group): Five (5).
 3. Construction Keys (where required): Ten (10).
 4. Construction Control Keys (where required): Two (2).
 5. Permanent Control Keys (where required): Two (2).
- H. Construction Keying: Provide temporary keyed construction cores.
- I. Key Registration List (Bitting List):
1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
 2. Provide transcript list in writing or electronic file as directed by the Owner.

2.5 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.
1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - ML2000 Series.
 - b. dormakaba Best (BE) - 45H Series.
 - c. Sargent Manufacturing (SA) - 8200 Series.
- B. Multi-Point Locksets: ANSI/BHMA A156.37, Certified Products Directory (CPD) listed vertical rod locking devices designed for openings requiring multiple latching points within one locking mechanism. Rods are retracted by dual mounted outside lever trim controls available in a variety of ANSI/BHMA operational functions. Option for single top latching only eliminates the need for bottom strikes.
1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - MP9800 Series.
 - b. Sargent Manufacturing (SA) - 7000 Series.

2.6 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.

3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.7 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
5. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
 - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
6. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
7. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.

8. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
 9. Rail Sizing: Provide exit device rails factory sized for proper door width application.
 10. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.
1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
 - b. Sargent Manufacturing (SA) - 80 Series.
 - c. Von Duprin (VD) - 35A/98 XP Series.

2.8 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.
 2. Standards: Closers to comply with UL-10C 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 Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
 4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
 5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
 6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed 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 body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.

1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - DC8000 Series.
 - b. LCN Closers (LC) - 4040XP Series.
 - c. Norton Rixson (NO) - 9500 Series.
 - d. Sargent Manufacturing (SA) - 281 Series.

2.9 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:
 - a. Stainless Steel: 300 grade, 050-inch thick.
5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:
 - a. Burns Manufacturing (BU).
 - b. Hiawatha, Inc. (HI).
 - c. Rockwood (RO).

2.10 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, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. 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. Manufacturers:
 - a. Burns Manufacturing (BU).
 - b. Hiawatha, Inc. (HI).
 - c. Rockwood (RO).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:
 - a. Norton Rixson (RF).
 - b. Rockwood (RO).
 - c. Sargent Manufacturing (SA).

2.11 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 NPFA 252, Standard Methods of 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.

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. Manufacturers:

1. National Guard Products (NG).
2. Pemko (PE).
3. Reese Enterprises, Inc. (RE).

2.12 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.

2.13 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.

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 architect 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. DHI TDH-007-20: Installation Guide for Doors and Hardware.
 - 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. 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.

- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

- E. 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 (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
 - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

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. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. 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 architect 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.

- 1. Quantities listed are for each pair of doors, or for each single door.
- 2. The supplier is responsible for handing and sizing all products.
- 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
- 4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

- B. Manufacturer's Abbreviations:

- 1. MK - McKinney
- 2. PE - Pemko
- 3. RO - Rockwood
- 4. SA - SARGENT
- 5. RF - Rixson
- 6. NO - Norton
- 7. OT - Other

Hardware Sets

Set: 1.0

Doors: [NE ARCADE-101](#)

6 Hinge, Full Mortise, Hvy Wt	T4A3386	US32D	MK
1 Concealed Vert Rod Exit, Dummy	DG164 16 MD8610 863	US32D	SA
1 Concealed Vert Rod Exit, Nightlatch	DG164 16 MD8610 113 x 863	US32D	SA
3 Core	DG1 6300	US15	SA
2 Surface Closer	9500	689	NO
2 Door Stop	400 / 441CU	US26D	RO
1 Threshold	25_x_AFG MSES25SS-2 (Width as Required)		PE
1 Gasketing	290APK x 2891APK		PE
2 Sweep	18061CNB		PE
2 Astragal	18041CNB		PE

Set: 2.0

Doors: [NATHANS-105C](#)

6 Hinge, Full Mortise, Hvy Wt	T4A3386	US32D	MK
1 Dust Proof Strike	570	US26D	RO
2 Flush Bolt	555	US26D	RO
1 Classroom Lock	DG164 8237 LL	US32D	SA
1 Core	DG1 6300	US15	SA
2 Conc Overhead Stop	1-336	630	RF
2 Surface Closer	9500	689	NO
1 Threshold	25_x_AFG MSES25SS-2 (Width as Required)		PE
1 Gasketing	290APK x 2891APK		PE
2 Sweep	18061CNB		PE
2 Astragal	18041CNB		PE

Set: 3.0

Doors: [NATHANS-106B](#), [SE ARCADE-100H](#)

3 Hinge, Full Mortise	TA2314	US32D	MK
1 Passage Latch	8215 LL	US32D	SA
1 Conc Overhead Stop	1-336	630	RF

CONTRACT NO. 22-523
 DIVISION 8 – OPENINGS

3 Silencer 608-RKW RO

Set: 4.0

Doors: CXA-101A, CXA102A, CXD-101A, CXD-101B, CXE-101A, CXE-102A, CXF-101C, CXF-101D, CXF-101E, DCV-101B, DCV-101C, DCV-102A, NATHANS-101B, NATHANS-101C, NATHANS-101D, NE ARCADE-100A, NE ARCADE-100B, NE ARCADE-100C, NE ARCADE-100D, NE ARCADE-100G, NE ARCADE-100H, NE ARCADE-100J, SE ARCADE-100A, SE ARCADE-100D, SE ARCADE-100E, SE ARCADE-100F, SE ARCADE-100G

1 Core DG1 6300 US15 SA
 1 Cylinder As Required x Temp Core US32D SA

Notes: Balance of hardware by assembly manufacturer.

Set: 5.0

Doors: NE ARCADE-100K

8 Hinge, Full Mortise, Hvy Wt T4A3386 US32D MK
 1 Surface Vert Rod Exit DG164 16 NB8710 863 US32D SA
 1 Surface Vert Rod Exit DG164 16 NB8710 313 x 863 US32D SA
 3 Core DG1 6300 US15 SA
 2 Surface Closer UNI9500 689 NO
 1 Threshold 25_x_AFG MSES25SS-2 (Width as Required) PE
 1 Gasketing 290APK x 2891APK PE
 2 Sweep 18061CNB PE
 2 Astragal 18041CNB PE

Notes: GC to confirm existing hardware will accept new hardware prior to releasing any material for fabrication.

Set: 6.0

Doors: CXF-101B, NATHANS-105B

1 Existing Opening No Hardware Specified OT

Set: 7.0

Doors: CXA103A, NATHANS-101, NATHANS-101A, NATHANS-102, NATHANS-105D

3 Hinge, Full Mortise TA2314 US32D MK
 1 Storeroom/Closet Lock DG164 8204 LL US32D SA
 1 Core DG1 6300 US15 SA

CONTRACT NO. 22-523
 DIVISION 8 – OPENINGS

1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Door Stop	400 / 441CU	US26D	RO
1 Gasketing	S773BL		PE

Set: 8.0

Doors: [SE ARCADE-100J](#)

3 Hinge, Full Mortise	TA2314	US32D	MK
1 Storeroom/Closet Lock	DG164 8204 LL	US32D	SA
1 Core	DG1 6300	US15	SA
1 Conc Overhead Stop	1-336	630	RF
3 Silencer	608-RKW		RO

Set: 9.0

Doors: CXA101B, CXA104A, CXD-101C, CXD-101D, CXD-103A, CXE-101B, CXE-102B, CXF-101A, DCV X1, DCV-101A, [NATHANS-102A](#), [NATHANS-104](#), [SE ARCADE-100B](#)

3 Hinge, Full Mortise, Hvy Wt	T4A3386	US32D	MK
1 Storeroom/Closet Lock	DG164 8204 LL	US32D	SA
1 Core	DG1 6300	US15	SA
1 Conc Overhead Stop	1-336	630	RF
1 Threshold	25_x_AFG MSES25SS-2 (Width as Required)		PE
1 Gasketing	290APK x 2891APK		PE
1 Sweep	18061CNB		PE

Set: 10.0

Doors: CXA102B, [CXA106A](#), [NE ARCADE-102](#), [NE ARCADE-103](#), [SE ARCADE-102](#), [SE ARCADE-103](#)

6 Hinge, Full Mortise, Hvy Wt	T4A3386	US32D	MK
1 Dust Proof Strike	570	US26D	RO
2 Flush Bolt	555	US26D	RO
1 Storeroom/Closet Lock	DG164 8204 LL	US32D	SA
2 Conc Overhead Stop	1-336	630	RF
2 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Threshold	25_x_AFG MSES25SS-2 (Width as Required)		PE
1 Gasketing	290APK x 2891APK		PE
2 Sweep	18061CNB		PE
2 Astragal	18041CNB		PE

Set: 11.0

Doors: CXA107A, CXD-102A, CXE-103A, NE ARCADE-100E, NE ARCADE-100F, NE ARCADE-100L, SE ARCADE-100C

3 Hinge, Full Mortise, Hvy Wt	T4A3386	US32D	MK
1 Rim Exit Device, Storeroom	DG164 16 8804 ETL	US32D	SA
1 Core	DG1 6300	US15	SA
1 Surface Closer	UNI9500	689	NO
1 Threshold	25_x_AFG MSES25SS-2 (Width as Required)		PE
1 Gasketing	290APK x 2891APK		PE
1 Sweep	18061CNB		PE

Set: 13.0

Doors: CXA105A

3 Hinge, Full Mortise, Hvy Wt	T4A3386	US32D	MK
1 Dormitory/Exit Lock	DG164 8225 LL	US32D	SA
1 Core	DG1 6300	US15	SA
1 Surface Closer	UNI9500	689	NO
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Threshold	25_x_AFG MSES25SS-2 (Width as Required)		PE
1 Gasketing	290APK x 2891APK		PE
1 Sweep	18061CNB		PE

Set: 14.0

Doors: DCV-103A

3 Hinge, Full Mortise, Hvy Wt	T4A3386	US32D	MK
1 Classroom Lock	DG164 8237 LL	US32D	SA
1 Core	DG1 6300	US15	SA
1 Surface Closer	UNI9500	689	NO
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Threshold	25_x_AFG MSES25SS-2 (Width as Required)		PE
1 Gasketing	290APK x 2891APK		PE
1 Sweep	18061CNB		PE

Set: 15.0

CONTRACT NO. 22-523
DIVISION 8 – OPENINGS

Doors: NE ARCADE-105, NE ARCADE-106

3 Hinge, Full Mortise	TA2314	US32D	MK
1 Privacy Lock	V21 8265 LL	US32D	SA
1 Surface Closer	9500	689	NO
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Door Stop	400 / 441CU	US26D	RO
3 Silencer	608-RKW		RO

Set: 16.0

Doors: NE ARCADE-107

3 Hinge, Full Mortise	TA2314	US32D	MK
1 Storeroom/Closet Lock	DG164 8204 LL	US32D	SA
1 Core	DG1 6300	US15	SA
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO
1 Door Stop	400 / 441CU	US26D	RO
3 Silencer	608-RKW		RO

Set: 17.0

Doors: NE ARCADE-200

3 Hinge, Full Mortise, Hvy Wt	T4A3386	US32D	MK
1 Storeroom/Service Lock	DG164 8206 LL	US32D	SA
1 Core	DG1 6300	US15	SA
1 Conc Overhead Stop	1-336	630	RF

END OF SECTION 087100

SECTION 08 80 00 - GLASS AND GLAZING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the glass and glazing as shown on the drawings and/or specified herein, including, but not limited to, glazing of the following:
 - 1. Doors.
 - 2. Entrances and storefront framing.
 - 3. Interior borrowed lites.

1.3 RELATED SECTIONS

- A. Stile and Rail Wood Doors – Section 08 14 33
- B. Aluminum Entrances and Storefronts - Section 08 41 13.
- C. Steel Windows – Section 08 51 23
- D. Aluminum Windows – Section 08 51 13

1.4 REFERENCES

- A. Comply with the recommendations of the following references unless more stringent requirements are indicated herein.
 - 1. FGMA Publications: FGMA Glazing Manual.
 - 2. LSGA Publications: LSGA Design Guide.
 - 3. SIGMA Publications: TM-3000 Vertical Glazing Guidelines.
 - 4. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201, Safety Standards for Architectural Glazing, Sealed Insulating Glass Manufacturing Association.
 - 5. Fire-Resistive Glazing Products for Door Assemblies: Products identical to those tested per ASTM E 152, labeled and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 6. ASTM C 920-14a, Standard Specification for Elastomeric Joint Sealants.
 - 7. Insulating Glass Criteria: IGCC International Glass Certification Council.

1.5 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 thicknesses indicated on drawings and/or specified herein are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, 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. Specified Design Wind Loads: 30 psf or greater if required by Code.
 2. Probability of Breakage for Vertical Glazing:
 - a. 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
 - b. 1 lite per 1000 for lites installed 15 degrees from the vertical and under wind action.
 - c. Load Duration: 60 seconds or less.
 3. Maximum Lateral Deflection: For glass supported on all four edges, provide thickness required that limits center deflection at design wind pressure to 1/100 times the short side length or 1/2", whichever is less.
 4. 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.
 - a. Temperature Change (Range): 120 deg. F ambient; 180 deg F, material surfaces.
 5. Thermal Solar Performance: See Article 2.2 herein.
- C. Glass units shall be annealed, heat strengthened, fully tempered or laminated where required to meet wind load and safety glazing requirements, as shown, specified, or recommended by the glass fabricator, and as required by the prevailing Building Code.

1.6 SUBMITTALS

- A. Product Data: Submit manufacturer's printed product data, specifications, standard details, installation instructions, use limitations and recommendations for each material used. Provide certifications that materials and systems comply with specified requirements, including performance requirements.
- B. Submit compatibility and adhesion test reports from sealant manufacturer indicating materials were tested for compatibility and adhesion with glazing sealant, as well as other glazing materials including insulation units.
- C. Initial Selection Samples: Submit samples of each glass and glazing material showing complete range of colors, textures, and finishes available for each material used.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

1. Submit complete range of samples of standard colors and patterns for ceramic frits at insulating glass.
 2. Submit complete range of samples of sandblasted glass showing variations of grits and opacity achieved.
- D. Verification Samples: Submit representative samples of each glass and glazing material that is to be exposed in completed work. Show full color ranges and finish variations expected. Provide glass samples having minimum size of 144 sq. in. and 6 in. long samples of sealants and glazing materials; all samples shall bear the name of the manufacturer, brand name, thickness, and quality.
- E. Calculations: Provide wind load charts, calculations, thermal stress analysis, and certification of performance of this work. Indicate how design requirements for loading and other performance criteria have been satisfied. Document shall be signed and sealed by a Professional Engineer licensed in the State of New York.
- F. Test Reports: Provide certified reports for specified tests.
- G. Warranties: Provide written warranties as specified herein.

1.7 QUALITY ASSURANCE

- A. Source: For each glass and glazing type required for work of this Section, provide primary materials which are products of one manufacturer. Provide secondary or accessory materials which are acceptable to manufacturers of primary materials.
- B. Installer: A firm with a minimum of five years' experience in type of work required by this Section and which is acceptable to manufacturers of primary materials; and with a successful record of in-service installations similar in size and scope to this Project.
- C. Glass Thickness: Glass thicknesses shown on drawings and/or specified herein are minimum thicknesses. Determine and provide size and thickness of glass products that are certified to meet or exceed performance requirements specified in this Section.
- D. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated.
1. GANA Publications: GANA's "Glazing Manual" and "Laminated Glass Design Guide."
 2. IGMA Publications: IGMA TM-3000, "Vertical Glazing Guidelines for Sealed Insulating Glass Units."
- E. Glazing for Fire-Rated Door Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.
- F. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.
1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council.
 - a. For glazing types with multiple lites of glass, laminated or assembled into an insulating unit, where safety labeling is required, provide labels that align in

position and orientation from lite to lite.

2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites 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.
- G. Insulating Glass Certification Program: Permanently marked on spacers with appropriate certification label of the following testing and inspecting agency:
1. Insulating Glass Certification Council.
 2. Associated Laboratories, Inc.
 3. Insulating Glass Manufacturers Alliance.
- H. Manufacturer shall be ISO 9001-2000 Certified.

1.8 TESTS

- A. Preconstruction Sealant Test: Submit samples of materials to be used to glazing sealant manufacturer to determine sealant compatibility. Include samples of glass, gaskets, glazing materials, framing members, and other components and accessories of glazing work. Test in accordance with ASTM C 794 to verify what type of primers (if any) are required to ensure sealant adhesion to substrates.
1. Submit minimum of nine pieces of each type and finish of framing member, and nine pieces of each type, class, kind, condition, and form of glass, including monolithic, laminated, and insulating glass for adhesion tests.
 2. Provide manufacturer's written report and recommendations regarding proper installation.

1.9 PROJECT CONDITIONS

- A. Weather: Perform work of this Section only when existing or forecasted weather conditions are within limits established by manufacturers of materials and products used.
- B. Temperature Limits: Install sealants only when temperatures are within limits recommended by sealant manufacturer, except, never install sealants when temperatures are below 40 deg. F.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials and products in unopened, factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations and GANA Manual.
1. Protect materials from moisture, sunlight, excess heat, sparks and flame.
 2. Sequence deliveries to avoid delays, but minimize on-site storage.

1.11 WARRANTIES

- A. General: Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.
- B. Manufacturer's Special Project Warranty on Coated Glass Products: Provide written warranty signed by manufacturer of coated glass agreeing to furnish f.o.b. point of manufacture, within specified warranty period indicated below, replacements for those coated glass units which develop manufacturing defects. Manufacturing defects are defined as peeling, cracking or deterioration in metallic coating due to normal conditions and not due to handling or installation or cleaning practices contrary to glass manufacturer's published instructions.
 - 1. Warranty Period: Manufacturer's standard but not less than five (5) years after date of substantial completion.
- C. Manufacturer's Special Project Warranty on Insulating Glass: Provide written warranty signed by manufacturer of insulating glass agreeing to furnish f.o.b. point of manufacture, freight allowed project site, within specified warranty period indicated below, replacements for those insulating glass units developing manufacturing defects. Manufacturing defects are defined as failure or hermetic seal of air space (beyond that due to glass breakage) as evidenced by intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coatings, if any, and other visual indications of seal failure or performance; provided the manufacturer's instructions for handling, installing, protecting and maintaining units have been complied with during the warranty period.
 - 1. Warranty Period: Manufacturer's standard but not less than ten (10) years after date of substantial completion.
- D. Manufacturer's Special Project Warranty on Laminated Glass: Manufacturer's standard form, made out to Owner and signed by laminated glass manufacturer agreeing to replace laminated glass units that develop edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by GANA standards within the specified warranty period indicated below. Upon notification of such deterioration within the warranty period, furnish replacement glass units, including labor for installation, for those glass units having edge separation, delamination and blemishes at the convenience of the Owner.
 - 1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS/FABRICATORS

- A. All glass and glazing used at the exterior of the Project shall be manufactured by the same manufacturer. The same manufacturer and the same furnace shall be used for all tempered and heat strengthened glass used throughout the project. Acceptable manufacturers include, but are not limited to, the following:
 - 1. PPG Industries.
 - 2. Guardian Industries.
 - 3. Pilkington.
 - 4. AFG.

5. JE Berkowitz, LP.
6. Viracon.

2.2 GLASS MATERIALS AND PRODUCTS

- A. Clear Float Glass: ASTM C 1036, Type I (transparent, flat), Class 1 (clear), Quality q3, minimum 1/4" thick.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent glass, flat); Quality q3 (glazing select), fabricated by horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed.
- C. Sputter-Coated Float Glass: Float glass with metallic-oxide or metallic-nitride coating deposited by vacuum deposition process after manufacture and heat treatment (if any).
- D. Clear Tempered Glass: ASTM C 1048, Condition A (uncoated), Type I (transparent, flat), Class 1 (clear), Quality q3, Kind FT, minimum 1/4" thick. Tempered glass must be certified by SGCC to meet applicable standards.
 1. Performance Requirements for Tempered Glass
 - a. Length and Width: For 2.9 mm to 6.0 mm; +/-1.6 mm.
 - b. Diagonal: +/- 3.0 mm.
 - c. Edgework: Belt seaming or diamond wheels. 1.5 mm seam of upper and lower glass edges. No sharp edges.
 - d. Corners: No more than 3.0 mm from square.
 - e. Float Glass Defects: Must meet the requirements of ASTM C 1036. The most common defects are scratches, stones gaseous bubbles and edge chips. Tables in the glass standards have limits for size/quantity of defects.
 - f. Tempered glass shall have a minimum surface compression of 10,000 psi.
 - g. Tempered glass to be heat-treated by horizontal (roller hearth) process with inherent roller-wave distortion parallel to the bottom edge of the glass when installed.
 - h. Flatness Tolerances
 - 1). Roller-Wave or Ripple: The deviation from flatness at any peak shall be targeted not exceed 0.003" as measured per peak to valley for 1/4" (6mm) thick glass.
 - 2). Bow and Warp: The bow and warp tolerances shall not exceed 1/32" per linear foot.
 - 3) Fully tempered glass shall be heat soaked to EN 14179-1:2005- European Heat Soaking Standard.
- E. Laminated Safety Glass: Provide two glass panes of equal thickness, laminated together with a polyvinyl butyl interlayer, conforming to ASTM C 1172 and as follows:
 1. Interlayer Color: Clear.
 2. Interlayer Material: Provide Eastman Chemical "Saflex" or "Vanceva," or DuPont "Butacite," 0.030" thick at vertical applications, and 0.060" thick at sloped or

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

horizontal applications.

3. Thickness: 15/32".

F. Insulating Glass

1. Glass Assembly: Double pane, 1" thick.

a. 1/4" (6mm) clear HS with VNE-63 #2.

b. 1/2" (13.2mm) air space, black.

c. 1/4" (6mm) clear HS.

2. Performance

a. Visible Light Transmittance: 47%.

b. Winter U-Value: 0.29.

c. Summer U-Value: 0.27.

d. Shading Coefficient: 0.28.

e. Solar Heat Gain Coefficient (SHGC): 0.24.

f. Light-to-Solar Gain (LSG): 1.96.

3. Sealing System: Dual Seal.

4. Primary Sealant: Polyisobutylene.

5. Secondary Sealant: Silicone, General Electric IGS 3204 or IGS 3100, or Dow Corning 982.

a. For structurally glazed IG units, secondary seal shall conform to ASTM C 1249.

b. Primary and secondary seals shall not contain voids and must be continuously bonded to the glass structure.

6. Spacer: Clear finish aluminum with welded, soldered, or bent corners, hollow tube types, filled with low nitrogen absorption desiccant.

7. Desiccant: Molecular sieve, silica gel, or blend of both.

8. Interspace Content: Argon.

9. Glass Thickness: 1/4" minimum.

10. Low 'E' Coating: Provide high-performance, clear, metallic coating of type and performance specified above.

11. Units shall be certified for compliance with seal classification "CBA" by the Insulating Glass Certification Council (IGCC) or by IGMA, and tested in accordance with the above ASTM Test Methods.

12. Insulating glass shall conform to the following tolerances:

a. Length and Width: + 3.0 mm/ -2.0 mm.

b. Diagonal: +/- 3.0 mm.

c. Thickness: As agreed +/- 1.0 mm.

d. Edge-Deletion of Coating: Minimum 8 mm wide. Width of deletion must

be more than the width of the secondary seal. Silver layer(s) must be completely removed. Appearance must be uniform.

- e. Primary PIB Seal: Must be complete with no breaks. Appearance must be uniform. PIB bead must overlap coating. No visible bright line when glass is viewed in transmission. The width of the PIB bead shall be 4.0 mm + 3.0/ - 1.5 mm.
- f. Secondary Seal: Nominal 6 mm + 3.0/ - 1.5 mm. The minimum width of the secondary silicone seal for IG units that are glazed structurally must be determined according to ASTM C 1249. The secondary seal must be uniformly applied without bubbles, cavities or gaps. Avoid excess sealant that will need to be trimmed off later.

13. Additional requirements and properties for primary and secondary insulating glass seals and spacers:

- a. All glass units shall comply with IGMA Guidelines which limits the dimension of the visible edge seal encroachment into the vision area to be no greater than the sightline infringement of 3mm (0.12").
- b. Insulating glass unit hermetic seal to consist of butyl primary and silicone secondary seals with bent, welded, or soldered interpane spacer corners; keyed corners are not acceptable unless also soldered or welded. Spacers shall be aluminum or stainless steel. Locate spacer joint at the top or sides of the units, but in no instances at the sill. Design units to minimize the number of spacer joints. Provide solid keys, embedded in butyl sealant on all four sides, at spacer joints.
- c. Hermetic seals must be continuous and intimately bonded to both lites of glass. Provide primary seal of uniform depth with a nominal width of 1/8" to 3/16". Hermetic seals shall not be contaminated with debris, fingerprints, or other foreign matter and shall not contain voids or air pockets that decrease the width of the seal below the minimum widths listed in these Specifications, or that breach the seal. The width of the primary seal shall not be less than 1/16", and the total cumulative length of the primary seal between 1/16" and 1/8" shall be less than 12" in any one insulating glass unit. The primary seal shall not have a reduced thickness at the corners. An increased thickness of the primary seal at the corners is acceptable.
 - d. Provide secondary seal of uniform depth with a nominal width of 1/4". Provide a total width of the primary and secondary seal of 1/2". Units shall carry CBA rating as established by ASTM E 774 and shall meet SIGMA 657-2, latest edition. Units shall not contain breather or capillary tubes or similar penetrations.

2.3 GLAZING MATERIALS AND PRODUCTS

- A. General: Provide sealants and gaskets with performance characteristics suitable for applications indicated. Ensure compatibility of glazing sealants with insulating glass sealants, with laminated glass interlayers, and with any other surfaces in contact.
- B. General Glazing and Cap Bead Sealant: Provide sealant with maximum Shore A

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

hardness of 50. Provide one of the following:

1. Dow Corning 795.
 2. General Electric Silglaze N 2500 or Contractors SCS-1000.
 3. Tremco Spectrem 2.
- C. Weather Seal Sealant: Provide non-acid curing sealant with movement range $\pm 50\%$, ASTM C 719. Provide one of the following:
1. Dow Corning 795.
 2. General Electric Silpruf.
 3. Tremco Spectrem 2.
- D. Backer Rod: Closed cell non-gassing polyethylene rod with rod diameter 25% wider than joint width.
- E. Dense Elastomeric Compression Seal Gaskets: Provide molded or extruded neoprene or EPDM gaskets, Shore A hardness of 75 ± 5 for hollow profile, and 60 ± 5 for solid profiles, ASTM C 864.
- F. Cellular, Elastomeric Preformed Gaskets: Provide extruded or molded closed cell, integral-skinned neoprene, Shore A 40 ± 5 , and 20% to 35% compression, ASTM C 509; Type II.
- G. Preformed Glazing Tape: Provide solvent-free butyl-polyisobutylene rubber with 100% solids content complying with ASTM C 1281 AAMA A 800 with integral continuous EPDM shim. Provide preformed glazing tape in extruded tape form. Provide Tremco "Polyshim II" or approved equal.
- H. Setting Blocks: Provide 100% silicone blocks with Shore A hardness of 80-90. Provide products certified by manufacturer to be compatible with silicone sealants. Length to be not less than 4". Width for setting blocks to be 1/16" more than glass thickness and high enough to provide the lite recommended by glass manufacturer. When thickness of setting block exceeds 3/4" the glass manufacturer must be consulted for sizes and configuration. In a vented system, setting block shall be designed so as to not restrict the flow of water within the glazing rabbet to the weep holes.
1. Shims: For shims used with setting blocks, provide same materials, hardness, length and width as setting blocks.
 2. Structural Silicone Glazing: Provide silicone setting blocks where structural silicone occurs at sills and at insulating units with silicone edge seals.
- I. Edge Blocks: Provide neoprene or silicone as required for compatibility with glazing sealants. Provide blocks with Shore A hardness of 55 ± 5 .
- J. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place.
- K. Miscellaneous Glazing Materials: Provide sealant backer rods, primers, cleaners, and sealers of type recommended by glass and sealant manufacturers.

2.4 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

- A. Fabricate glass and other glazing products 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

standard, 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 indoor and outdoor faces.
- C. Grind smooth and polish exposed glass edges.

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 GENERAL GLAZING STANDARDS

- A. Install products using the recommendations from the manufacturer of glass, sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those in the GANA "Glazing Manual."
- B. Verify that Insulating Glass Unit (IGU) secondary seal is compatible with glazing sealants.
- C. Install glass in prepared glazing channels and other framing members.
- D. Install setting blocks in rabbets as recommended by referenced glazing standards in GANA's "Glazing Manual" and IGMA's "Glazing Guidelines."
- E. Provide bite on glass, minimum edge and face clearances and glazing material tolerances recommended by GANA's "Glazing Manual."
- F. Provide weep system as recommended by GANA's "Glazing Manual."
- G. Set glass lites in each series with uniform pattern, draw, bow and similar characteristics.
- H. Distribute the weight of glass unit along the edge rather than the corner.
- I. Comply with manufacturers and referenced industry standards on expansion joint and anchors; accommodating thermal movement; glass openings; use of setting blocks, edge, face, and bite clearances; use of glass spacers; edge blocks and installation of weep systems.
- J. Protect glass edge damage during handling and installation.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

- K. Prevent glass from contact with contaminating substances that result from construction operations, such as weld spatter, fireproofing or plaster.
- L. Remove and replace glass that is broken, chipped cracked or damaged in any way.

3.4 GLAZING

- A. Glazing channel dimensions, as indicated on Shop Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- B. 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.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- D. 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. Install setting blocks at the one greater points of each lite along the horizontal mullion.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where the length plus width is larger than 50 inches 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 1/8" 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.
- G. 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.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. 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.
- J. 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.
- K. Flush Glazing
 - 1. If the butt joint in the metal framing is in the vertical direction, the glazier shall run the tape initially on the head and sill members going directly over this joint. Should the butt joint in the metal framing run horizontally, tapes must first be

applied to the jambs so that it crosses over the joint.

2. Each tape section shall butt the adjoining tape and be united with a tool to eliminate any opening.
3. Do not overlap the adjoining length of tape or rubber shim as this will prevent full contact around the perimeter of glass.

L. Off-Set Glazing

1. Where the glazing legs are off-set, the difference in the rabbet width shall be compensated by employing different glazing tapes with different diameter shims. The difference in shim shall be equal to the size of the off-set. The thinner tape shall be positioned first on the glazing leg closest to the interior. The thicker tape shall be cut to the exact length of the dimension between the applied tapes, and installed on the outermost glazing leg.
2. Immediately prior to setting glass, paper backing shall be removed. Apply a toe bead of sealant 6" in each direction, from each corner.
3. Locate setting blocks in the sill member at quarter points, or if necessary to within 6" of each corner. Setting blocks must be set equal distance from center line of the glass and high enough to provide the recommended bite and edge clearances.
4. Set edge block according to glass manufacturer's recommendations.
5. Set Glass: The glass shall be pressed firmly against the tape to achieve full contact.
6. In a vented system, apply a heel bead (air seal) of sealant around the perimeter of glass, between the sole of the I.G. unit and the base of the rabbet of the metal framing developing a positive bond to the unit and to the metal framing. The bead of the sealant shall be deep enough so that it will partially fill the channel to a depth of 1/4" between the glass edge and the base of the metal framing rabbet.
7. Interior stops shall be set, and glazing tape spline for the appropriate face clearance shall be rolled into place, compressing the glass to the shim within the glazing tape.

3.5 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant as recommended by glass manufacturer or glass frame manufacturer.
- G. Center glass lites in openings on setting blocks and press firmly against tape by

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

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.

- H. Apply cap bead of elastomeric sealant over exposed edge of tape where noted on approved shop drawings.

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

3.6 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance 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.

3.7 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.
 - 1. Exterior glazing gasket shall be set a minimum of 1/8" below exterior glazing stop to create a channel for sealant installation.
- 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.

3.8 PROTECTION AND CLEANING

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. 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 them 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 build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.
- E. Clean excess sealant or compound from glass and framing members immediately after application, using solvents or cleaners recommended by manufacturers.
- F. Glass to be cleaned according to:
 - 1. GANA Glass Information Bulletin GANA 01-0300 – "Proper Procedure for Cleaning Architectural Glass Products."

CONTRACT No. 22-523
DIVISION 8 – OPENINGS

2. GANA Glass Informational Bulletin GANA TD-02-0402 – "Heat Treated Glass Surfaces are Different."

G. Do not use razor blades, scrapers or metal tools to clean glass.

3.9 MONOLITHIC GLASS SCHEDULE

- A. Uncoated Clear Glass: Where glass as designated below is indicated, provide Type I (transparent glass, flat),
 1. Class 1 (clear) glass lites.
 2. Thickness: 1/4 inch.
 3. Kind FT (fully tempered) where required by Code and where indicated on Drawings.

3.10 INSULATING GLASS SCHEDULE

- A. Glass Type: Low-E-coated, clear insulating glass.
 1. Overall Unit Thickness: 1 3/4 inch.
 2. Minimum Thickness of Each Glass Lite: 6 mm.
 3. Outdoor Lite: Fully tempered float glass, clear.
 4. Interspace Content: Argon.
 5. Center Light: 6mm clear.
 6. Interspace Content: Argon.
 7. Indoor Lite: Fully tempered float glass, clear.
 8. Low-E Coating: Pyrolytic on second.
 9. Transmittance
 - a. Visible Light: 42%.
 - b. Solar Energy: 21%.
 - c. UV: 13%.
 10. Reflectance
 - a. Visible Light-Exterior: 34%.
 - b. Visible Light-Interior: 21%.
 - c. Solar Energy: 38%.
 11. NFRC U-Value
 - a. Winter: 0.19 Btu/(hr x sqft x °F).
 - b. Summer: 0.18 Btu/(hr x sqft x °F).
 12. Shading Coefficient (SC): 0.32.
 13. Relative Heat Gain: 66 Btu/(hr x sq. ft).
 14. Solar Heat Gain Coefficient (SHGC): 0.28.

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SECTION 09 24 00 - CEMENT PLASTERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior vertical plasterwork (stucco).
2. Exterior horizontal and non-vertical plasterwork (stucco).

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each type of factory-prepared finish coat and for each color and texture specified.

PART 2 - PRODUCTS

2.1 METAL LATH

A. Expanded-Metal Lath: ASTM C847, cold-rolled carbon-steel sheet with ASTM A653/A653M, G60 (Z180), hot-dip galvanized-zinc coating.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CEMCO; California Expanded Metal Products Co.
 - b. ClarkDietrich.
 - c. Or approved equal
2. Diamond-Mesh Lath: Flat lath for use over framing, Self-furring for use over CMU; 2.5 lb/sq. yd. (1.4 kg/sq. m)

2.2 ACCESSORIES

A. General: Comply with ASTM C1063, and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

B. Metal Accessories:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CEMCO; California Expanded Metal Products Co.

- b. ClarkDietrich.
- 2. Foundation Weep Scream: Fabricated from hot-dip galvanized-steel sheet, ASTM A653/A653M, G60 (Z180) zinc coating.
- 3. Cornerite: Fabricated from metal lath with ASTM A653/A653M, G60 (Z180), hot-dip galvanized-zinc coating.
- 4. External- (Outside-) Corner Reinforcement: Fabricated from metal lath with ASTM A653/A653M, G60 (Z180), hot-dip galvanized-zinc coating.
- 5. Control Joints: Fabricated from zinc-coated (galvanized) steel; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.

2.3 MISCELLANEOUS MATERIALS

- A. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
- B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch (13 mm) long, free of contaminants, manufactured for use in cement plaster.
- C. Bonding Compound: ASTM C932.
- D. Fasteners for Attaching Metal Lath to Substrates: ASTM C1063.
- E. Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch (1.21-mm) diameter unless otherwise indicated.

2.4 PLASTER MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type II.
 - 1. Color for Finish Coats: Gray.
- B. Colorants for Job-Mixed Finish Coats: Colorfast mineral pigments that produce finish plaster color to match Architect's sample.
- C. Lime: ASTM C206, Type S; or ASTM C207, Type S.
- D. Sand Aggregate: ASTM C897.
 - 1. Color for Job-Mixed Finish Coats: In color matching Architect's sample.
- E. Ready-Mixed Finish-Coat Plaster: Mill-mixed portland cement, aggregates, coloring agents, and proprietary ingredients.
 - 1. Manufacturers: Subject to compliance with requirements and compatibility with base-coat, provide products by one of the following:
 - a. LaHabra Stucco Solutions; Parex USA.
 - b. QUIKRETE.
 - 2. Color: Match Architect's sample.

2.5 PLASTER MIXES

- A. General: Comply with ASTM C926 for applications indicated.
 - 1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. yd. (0.6 kg of fiber/cu. m) of cementitious materials.
- B. Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork as follows:
 - 1. Portland Cement Mixes:
 - a. Scratch Coat: For cementitious material, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
 - b. Brown Coat: For cementitious material, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate used in scratch coat.
- C. Job-Mixed Finish-Coat Mixes:
 - 1. Portland Cement Mix: For cementitious materials, mix 1 part portland cement and **1-1/2 to 2** parts lime. Use 1-1/2 to 3 parts aggregate per part of cementitious material.
- D. Factory-Prepared Finish-Coat Mixes: For ready-mixed finish-coat plasters, comply with manufacturer's written instructions.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Prepare smooth, solid substrates for plaster according to ASTM C926.

3.2 INSTALLING METAL LATH

- A. Metal Lath: Install according to ASTM C1063.

3.3 INSTALLING ACCESSORIES

- A. Install according to ASTM C1063 and at locations indicated on Drawings.
- B. Reinforcement for Outside Corners:
 - 1. Install lath-type, external-corner reinforcement at exterior locations.
- C. Control Joints: to be located as follows:
 - 1. Delineate plasterwork into areas (panels) of the following maximum sizes:
 - a. Vertical Surfaces: 144 sq. ft. (13.4 sq. m).
 - b. Horizontal and Other Non-vertical Surfaces: 100 sq. ft. (9.3 sq. m).
 - c. At distances between control joints of not more than 18 feet (5.5 m) o.c.
 - d. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.

CONTRACT No. 22-523
DIVISION 9 – FINISHES

2. Where control joints occur in the surface of construction directly behind plaster.
3. Where plastered ceiling framing or furring changes direction.
4. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) to relieve the stress that occurs at the corner formed by the dimension change.

3.4 PLASTER APPLICATION

- A. General: Comply with ASTM C926.
- B. Bonding Compound: Apply on existing unit masonry and concrete substrates for direct application of plaster for repair of existing plaster without lath only.
- C. Walls; Base-Coat Mixes for Use over Metal Lath: For scratch and brown coats, for three-coat plasterwork with 3/4-inch (19-mm) total thickness, as follows:
 1. Portland cement mixes.
- D. Plaster Finish Coats: Apply to provide float finish
- E. Concealed Exterior Plasterwork: Where plaster application is used as a base for adhered finishes, omit finish coat.
- F. Concealed Interior Plasterwork:
 1. Where plaster application is concealed behind built-in cabinets, similar furnishings, and equipment, apply finish coat.
 2. Where plaster application is concealed above suspended ceilings and in similar locations, omit finish coat.

3.5 PLASTER REPAIRS

- A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.
- B. Preparation of the repair area:
 1. Remove finish in the area to be repaired. Straight line cuts must be made irregular by chipping away the edge.
 2. Remove any loose material and expose approximately 2" of the existing lath at all edges of the repair area.
 3. If existing plaster does not have lath, prepare substrate to allow good mechanical bonding for the new finish.
 4. Clean surface to remove all dust, dirt, and other bond-inhibiting materials.
- C. Use only a compatible plaster system for repairs and patches. Match adjacent plaster thicknesses.
- D. Apply the finish using the same type of product that exists on the wall, matching the existing finish, texture and color. Taper the new finish in to the existing finish.

END OF SECTION 09 24 00

SECTION 09 29 00 -GYPSUM DRYWALL

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the gypsum drywall as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Gypsum board work for partitions, ceilings, column enclosures, furring, and elsewhere where gypsum drywall work is shown on drawings.
 - 2. Metal supports for gypsum drywall construction.
 - 3. Acoustical insulation for gypsum drywall work.
 - 4. Sealant for gypsum drywall work.
 - 5. Concealed metal reinforcing for attachment of railings, toilet partitions and other items supported on drywall partitions and walls.
 - 6. Taping and finishing of drywall joints.
 - 7. Installing rings and frames in drywall surfaces for grilles, registers and lighting fixtures.
 - 8. Gypsum wallboard cants at beams and other projections over 2" deep in elevator shafts where adjoining wall is of gypsum wallboard construction.
 - 9. Bracing and connections.

1.3 RELATED SECTIONS

- A. Thermal Insulation - Section 072100.
- B. Hollow metal door frames - Section 081113.
- C. Wood Doors – Section 084113
- D. Painting and Finishing - Section 099000.
- E. Rings for grilles, registers and light fixtures - Division 23 and 26.

1.4 QUALITY ASSURANCE

- A. The following standards, as well as other standards which may be referred to in this Section, shall apply to the work of this Section:
 - 1. The Gypsum Construction Handbook, latest edition, USG.
 - 2. Construction Guide, latest edition, National Gypsum.

CONTRACT No. 22-523
DIVISION 9 – FINISHES

3. ASTM A 568 "Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements For"
 4. ASTM C 475 "Standard Specification for Joint Treatment Materials for Gypsum Wallboard Construction"
 5. ASTM C 645 "Standard Specification for Non-Structural Steel Framing Members"
 6. ASTM C 754 "Standard Specification for Installation of Steel Framing Members to Receive Screw Attached Gypsum Panel Products"
 7. ASTM C 840 "Standard Specification for Application and Finishing of Gypsum Board"
 8. ASTM C 919 "Standard Specification for Use of Sealants in Acoustical Applications"
 9. ASTM C 954 "Standard Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Studs From 0.033 in. to 0.112 in. in Thickness"
 10. ASTM C 1002 "Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Board"
 11. ASTM C 1177 "Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing"
 12. ASTM C 1178 "Standard Specification for Glass Mat Water Resistant Gypsum Backing Board"
 13. ASTM C 1278 "Standard Specification for Fiber-Reinforced Gypsum Panel"
 14. ASTM C 1396 "Standard Specification for Gypsum Board"
 15. ASTM D 3273 "Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber"
- B. Allowable Tolerances: 1/32" offsets between planes of board faces, and 1/16" in 8'-0" for plumb, level, warp and bow.
- C. System Design Load
1. Provide drywall shaft systems for elevators designed and tested by manufacturer to withstand a lateral loading (air pressure) of 10 lbs. per sq. ft. for the maximum wall height required, and with deflection limited to L/240 of partition height.
 2. Provide standard drywall wall assemblies designed and tested by manufacturer to withstand a lateral load of 5 lbs. per sq. ft. for the maximum wall height required, and with deflection limited to L/240 of partition height.
 - a. Drywall assemblies with tile finish shall have a deflection limit of L/360.
 3. Provide drywall ceiling assemblies designed, fabricated and installed to have a deflection not to exceed L/360.
- D. Fire-Resistance Rating: Where gypsum drywall with fire resistance ratings are indicated, provide materials and installations which are identical with those of applicable assemblies tested per ASTM E 119 by fire testing laboratories, or to design designations in UL "Fire Resistance Directory" or in listing of other testing agencies acceptable to authorities having jurisdiction, and compliant with UL Test #2079; criteria for cycle movement for all field height wall sections requiring allowance for

vertical deflection within framing details.

- E. Installer: Firm with not less than 5 years of successful experience in the installation of specified materials.

1.5 SUBMITTALS

- A. Submit shop drawing for each drywall partition, furring and ceiling system showing size and gauges of framing members, hanger and anchorage devices, wallboard types, insulation, sealant, methods of assembly and fastening, control joints indicating column lines, corner details, joint finishing and relationship of drywall work to adjacent work.
- B. Samples: Each material specified herein, 12" x 12", or 12" long, or in manufacturer's container, as applicable for type of material submitted.
- C. Manufacturer's Literature: Submit technical and installation instructions for each drywall partition, furring and ceiling system specified herein, and for each fire-rated and sound-rated gypsum board assembly. Submit other data as required to show compliance with these specifications, including data for mold resistant joint compound.
- D. Test Reports: This Contractor shall submit test report, obtained by drywall manufacturer, indicating conformance of drywall assemblies to required fire ratings and sound ratings.

1.6 PRODUCT HANDLING AND PROTECTION

- A. Deliver, store and handle drywall work materials to prevent damage. Deliver materials in their original, unopened containers or bundles, and store where protected from moisture, damage and from exposure to the elements. Store wallboard in flat stacks.
- B. Protect wallboard from becoming wet.

1.7 ENVIRONMENTAL CONDITIONS

- A. Provide and maintain minimum temperature of fifty-five (55) degrees F. and adequate ventilation to eliminate excessive moisture within the building in the area of the drywall work for at least twenty-four (24) hours, prior to, during and after installation of drywall work. Installation shall not start until windows are glazed and doors are installed, unless openings are temporarily closed. Space above suspended ceilings shall be vented sufficiently to prevent temperature and pressure build up.

1.8 JOB MOCK-UP

- A. At a suitable location, where directed by the Architect, lay up a portion of a finished wall and ceiling demonstrating the quality of work, including finishing, to be obtained under this Section. Omit drywall boards in locations as directed by the Architect to show stud spacing and attachments; after acceptance, complete assembly.
- B. Adjust the finishing techniques as required to achieve the finish required by the Architect as described in this Section of these specifications.
- C. Upon approval of the mock-up, the mock-up may be left in place as a portion of the finished work of this Section.
- D. All drywall work shall be equal in quality to approved mock-up.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers for Gypsum Drywall Panels and Accessories: U.S. Gypsum Co., Georgia Pacific, CertainTeed Corporation, Continental Building Products, or National Gypsum Co. meeting specification requirements are acceptable.
 - 1. All drywall products must be manufactured in North America.
- B. Acceptable Manufacturers for Metal Supports of Drywall Assemblies: Unless otherwise noted, provide products manufactured by ClarkDietrich Building Systems, Super Stud Building Products, Marino/Ware, or approved equal.

2.2 METAL SUPPORTS

- A. Metal Floor and Ceiling Runners
 - 1. Channel Type: Formed from 20 U.S. Std. gauge (unless otherwise noted) galvanized steel, width to suit channel type metal studs. Use 20 ga. top runners with 1-1/4" minimum flanges.
 - 2. Ceiling runners and head of wall connections at rated partitions shall conform to UL #2079 for cycle movement. Provide positive mechanical connection of framing to structure, allowing for vertical movement within connections. Minimum of 20 ga. galvanized steel for clips, 25 ga. galvanized steel for ceiling runners. Providing a friction free – anti-seizure movement capacity.
 - a. As manufactured by the Steel Network, VertiClip or VertiTrack or equal made by Metal-Lite Inc.
 - b. FireTrak (including stud clips) by FireTrak Corp. or equal made by Metal-Lite Inc.
 - 3. "J" Type: Formed from 20 U.S. Std. gauge galvanized steel, 1" x 2-1/2" or 4" wide (to suit detail) x 2-1/4" (for shaft wall).
- B. Metal Studs, Framing and Furring
 - 1. Channel Type Studs: Channel type with holes for passage of conduit formed from minimum 20 U.S. Std. gauge (unless heavier gauge is required to meet deflection limits) galvanized steel, width as shown on drawings.
 - 2. Furring Channels: Hat shaped, formed from galvanized steel, 25 U.S. Std. gauge.
 - 3. "C-H," "CT," or "I" Type Stud: 1-1/2" x 2-1/2", 4" or 6" wide (to suit detail) galvanized steel. Use for shaft wall construction; gauge and size as required to meet deflection limits given herein.
 - 4. Double "E" Type Stud or "J" Track with Holding Tabs: 1" x 2-1/2", 4" or 6" wide (to suit detail) galvanized steel. Use for shaft wall construction; gauge and size as required to meet deflection limits given herein.
 - 5. Continuous 16 gauge x 8" wide steel wall plate screwed to studs as required for support of railings, toilet partitions and other items supported on drywall partitions and walls.
- C. Suspended Ceiling and Fascia Supports

CONTRACT No. 22-523
DIVISION 9 – FINISHES

1. Main Runners: 1-1/2" steel channels, cold rolled at 0.475 lbs. per ft., rust-inhibitive paint finish.
 2. Furring Members: Screw-type hat-shaped furring channels of 25 ga. zinc-coated steel; comply with ASTM C 645.
 3. Hangers: Galvanized, 1" x 3/16" flat steel slats capable of supporting 5x calculated load supported.
 4. Hanger Anchorages: Provide inserts, clips, bolts, screws and other devices applicable to the required method of structural anchorage for ceiling hangers. Size devices for 5x calculated load supported.
 5. Furring Anchorages: 16 ga. galvanized wire ties, manufacturer's standard clips, bolts or screws as recommended by furring manufacturer.
- D. All galvanized steel members shall have coating conforming to ASTM A 653, G60.

2.3 GYPSUM WALLBOARD TYPES

- A. Gypsum Wallboard: 5/8" thick "Sheetrock" by USG, "Gold Bond" by National Gypsum, or "Regular Gypsum" by CertainTeed Corp., 48" wide, in maximum lengths available to minimize end-to-end butt joints.
- B. Flexible Type: 1/4" thick, manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness, long edges tapered.
- C. Gypsum Ceiling Board: 1/2" thick, sag-resistant, long edges tapered.
- D. Fire-Rated Gypsum Wallboard: 5/8" thick "Sheetrock Firecode C" by USG, "Firecheck Type C" by Lafarge/Continental, "Gold Bond Fireshield" by National Gypsum, or "Type C" and "Type X" by CertainTeed Corp., 48" wide, in maximum lengths available to minimize end-to-end butt joints.
- E. Water-Resistant Backing Board for Tile Finish: 5/8" thick, "DUROCK Glass Mat Tile Backerboard" by USG, "Dens-Shield Tile Backer Board" by Georgia Pacific, or "DiamondBack Tile Backer" by CertainTeed Corp. Cover joints with a pressure sensitive woven glass fiber tape equal to Imperial Type P Tape.
- F. Moisture/Mold-Resistant Gypsum Wallboard: 5/8" thick, where scheduled on drawings, "Mold Tough" or "Mold Tough FR" by U.S. Gypsum, "DensArmor Plus" by Georgia Pacific, "Mold Defense" and/or "Mold Defense Type X" by Lafarge/Continental, or "Gold Bond EXP Interior Extreme Gypsum Board" by National Gypsum, 48" wide, in maximum lengths available to minimize end-to-end butt joints. Board must have a rating of 10 per ASTM D 3273 with a core that meets ASTM C 1396, Section 6 or ASTM C 1658.
- G. Mold-Resistant Shaft Wall Liner: Solid gypsum board liner for shaft wall construction, 1" thick, 24" wide, as required to suit condition, by standard lengths as required, beveled edges. Provide "Mold Tough Liner Panel" by USG, "DensGlass Ultra Shaft Guard" by Georgia Pacific, "Mold Defense Shaftliner Type X" and/or "Weather Defense Shaftliner Type X" by Lafarge/Continental, "Gold Bond Brand Fireshield Shaft Liner XP," "Gold Bond Brand EXP Extended Exposure Shaft Liner" by National Gypsum, or "M2Tech Shaftliner" by CertainTeed Corp.
 1. Liner board must have a rating 10 per ASTM D 3273 with a core that meets ASTM C 1396 Section 6.

2.4 ACCESSORIES

- A. Acoustical Insulation: Paper-less, non-combustible, semi-rigid mineral fiber mat, 2" thick, in walls (unless otherwise indicated), 3 lb./cu. ft. maximum density; Thermafiber LLC "Thermafiber," or approved equal.
- B. Fasteners for Wallboard: USG Brand Screws; Type S Bugle Head for fastening wallboard to lighter gauge interior metal framing (up to 20 ga.). Type S-12 Bugle Head for fastening wallboard to heavier gauge interior metal framing (20 ga. to 12 ga.); Type S and Type S-12 Pan Head for attaching metal studs to door frames and runners; and Type G Bugle Head for fastening wallboard to wallboard. Lengths specified below under "Part 3 - Execution" Articles and as recommended by drywall manufacturer.
- C. Laminating Adhesive: "Sheetrock Brand Joint Compound."
- D. Metal Trim - Corner Beads: For 90 degree External Corners - "Dur-A-Bead" No. 103, 27 U.S. Std. ga. galvanized steel, 1-1/4" x 1-1/4", for 90 degree external corners.
- E. Metal Trim - Edge Beads: "Sheetrock Brand Paper Faced Metal Bead and Trim."
- F. Partition/Concrete Ceiling Trim: Trim-Tex Super Seal Tear Away or approved equal.
- G. Metal Trim Treatment Materials and Joint Treatment Materials for Gypsum Drywall Boards: Paper tape for joint reinforcing; Setting Type (Durabond 90) or Lightweight Setting Type Joint Compound for taping and topping; and Ready Mix Compound for finishing.
 - 1. For mold-resistant drywall, water resistant drywall, and tile backer board, use glass mesh tape with setting joint compound that is rated 10 when tested in accordance with ASTM D 3273 and evaluated in accordance with ASTM D 3274. Acceptable joint compound is "Rapid Set One Pass" made by CTS Cement Manufacturing Corp. or "Rapid Joint" manufactured by Lafarge North America or approved equal meeting standards noted herein.
- H. Control Joints: No. 0.093, USG.
- I. Acoustical Sealant: USG "Acoustical Sealant" or "Tremco Acoustical Caulking" of Tremco Mfg. Co., or approved equal.
- J. Neoprene Gaskets: Conform to ASTM D 1056.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where gypsum drywall is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. General
 - 1. Install drywall work in accordance with drywall manufacturer's printed instructions and as indicated on drawings and specified herein.

CONTRACT No. 22-523
DIVISION 9 – FINISHES

2. All metal framing for drywall partitions shall extend from floor to underside of structural deck above. Provide for vertical deflection with positive mechanical connections of framing members to structure.
 3. Provide concealed reinforcement, 16 ga. thick by eight (8) inches wide or as detailed or as recommended by manufacturer, for attachment of railings, toilet partitions, and other items to be supported on the partitions which cannot be attached to the metal framing members. Concealed reinforcement shall span between metal studs and be attached thereto using two (2) self-tapping pan head screws at each stud.
 - a. Back of drywall shall be scored or notched to prevent bulging out where reinforcement plate occurs.
- B. Fire-Rated Assemblies: Install fire-rated assemblies in accordance with requirements of authorities having jurisdiction, Underwriters' Laboratories and test results obtained and published by the drywall manufacturer, for the fire-rated drywall assembly types indicated on the drawings.
- C. Acoustical Assemblies: Install acoustically-rated assemblies to achieve a minimum STC as noted on drawings, in accordance with test results obtained and published by the drywall manufacturer, for the drywall assembly type indicated on the drawings.
- D. Sealant
1. Install continuous acoustical sealant bead at top and bottom edges of wallboard where indicated or required for sound rating as wallboard is installed, and between metal trim edge beads and abutting construction.
 2. Install acoustical sealant in 1/8" wide vertical control joints within the length of the wall or partitions, and in all other joints, specified below under "Control Joints." Install bead of acoustical sealant around electric switch and outlet boxes, piping, ducts, and around any other penetration in the wallboard; place sealant bead between penetrations and edge of wallboard.
 3. Where sealant is exposed to view, protect adjacent surfaces from damage and from sealant material, and tool sealant flush with and in same plane as wallboard surface. Sealant beads shall be 1/4" to 3/8" diameter.
- E. Wallboard Application
1. Do not install wallboard panels until steel door frames are in place; coordinate work with Section 081113, "Steel Doors and Frames."
 2. See drawings for all board types. Use fire-rated wallboard for fire-rated assemblies. Use sag-resistant board for ceilings. Use water-resistant wallboard where indicated on drawings and where wallboard would be subject to moisture. Install water-resistant wallboard in full, large sheets (no scraps) to limit number of butt joints.
 3. Apply wallboard with long dimension parallel to stud framing members, and with abutting edges occurring over stud flanges.
 4. Install wallboard for partitions from floor to underside of structure above and secure rigidly in place by screw attachment, unless otherwise indicated.
 5. Provide "Thermafiber" safing insulation meeting standards of Section 078413 at flutes of metal deck where partitions carry up to bottom of metal deck.

CONTRACT No. 22-523
DIVISION 9 – FINISHES

6. Neatly cut wallboard to fit around outlets, switch boxes, framed openings, piping, ducts, and other items which penetrate wallboard; fill gaps with acoustic sealant.
 7. Where wallboard is to be applied to curved surfaces, dampen wallboard on back side as required to obtain required curve. Finish surface shall present smooth, even curve without fluting or other imperfections.
 8. Screw fasten wallboard with power-driven electric screw driver, screw heads to slightly depress surface of wallboard without cutting paper, screws not closer than 3/8" from ends and edges of wallboard.
 9. Where studs are doubled-up, screw fasten wallboard to both studs in a staggered pattern.
- F. Metal Trim: Install and mechanically secure in accordance with manufacturer's instructions; and finish with three (3) coats of joint compound, feathered and finish sanded smooth with adjacent wallboard surface, in accordance with manufacturer's instructions.
1. Corner Beads: Install specified corner beads in single lengths at all external corners, unless corner lengths exceed standard stock lengths.
 2. Edge Beads: Install specified edge beads in single lengths at all terminating edges of wallboard exposed to view, where edges abut dissimilar materials, where edges would be exposed to view, and elsewhere where shown on drawings. Where indicated on drawings, seal joint between metal edge bead and adjoining surface with specified gasket, 1/8" wide minimum and set back 1/8" from face of wallboard, unless other size and profile indicated on drawings.
 3. Casing beads shall be set in long lengths, neatly butted at joints. Provide casing beads at juncture of board and vertical surfaces and at exposed perimeters.
- G. Control Joint Locations: Gypsum board surfaces shall be isolated with control joints where:
1. Ceiling abuts a structural element, dissimilar wall or other vertical penetration.
 2. Construction changes within the plane of the partition or ceiling.
 3. Shown on approved shop drawings.
 4. Ceiling dimensions exceed thirty (30) feet in either direction.
 5. Wings of "L," "U," and "T" shaped ceiling areas are joined.
 6. Expansion or control joints occur in the structural elements of the building.
 7. Shaftwall runs exceed 30' without interruption.
 8. Partition or furring abuts a structural element or dissimilar wall or ceiling.
 9. Partition or furring runs exceed 30' without interruption.
 10. Where control joints are required, ceiling height door frames may be used as control joints. Less than ceiling height frames shall have control joints extending to the ceiling from both corners.
- H. Joint Treatment and Spackling
1. Joints between face wallboards in the same plane, joints at internal corners of intersecting partitions and joints at internal corners of intersections between

ceilings and walls or partitions shall be filled with joint compound.

2. Screw heads and other depressions shall be filled with joint compound. Joint compound shall be applied in three (3) coats, feathered and finish surface sanded smooth with adjacent wallboard surface, in accordance with manufacturer's instructions. Treatment of joints and screw heads with joint compound is also required where wallboard will be covered by finish materials which require a smooth surface, such as vinyl wall coverings.

3.3 FURRED WALLS AND PARTITIONS

- A. Use specified metal furring channels. Run metal furring channel framing members vertically, space sixteen (16) inches o.c. maximum. Fasten furring channels to concrete or masonry surfaces with power-driven fasteners or concrete stub nails spaced sixteen (16) inches o.c. maximum through alternate wing flanges (staggered) of furring channel. Furring channels shall be shimmed as necessary to provide a plumb and level backing for wallboard. At inside of exterior walls, an asphalt felt protection strip shall be installed between each furring channel and the wall. Furring channel and splices shall be provided by nesting channels at least eight (8) inches and securely anchoring to concrete or masonry with two (2) fasteners in each wing.
- B. Wallboard Installation: Same as specified under Article 3.4 - "Metal Stud Partitions."

3.4 METAL STUD PARTITIONS

- A. Unless otherwise noted, steel framing members shall be installed in accordance with ASTM C 754.
- B. Runner Installation: Use channel type. Align accurately at floor according to partition layout. Anchor runners securely sixteen (16) inches o.c. maximum with power-driven anchors to floor slab, with power-driven anchors to structural slab above. See "Stud Installation" below for runners over heads of metal door frames. Where required, carefully remove sprayed-on fireproofing to allow partition to be properly installed.
- C. Stud Installation
 1. Use channel type, positioned vertically in runners, spaced as noted on drawings, but not more than sixteen (16) inches o.c.
 2. Anchor studs to floor runners with screw fasteners. Provide snap-in or slotted hole slip joint bolt connections of studs to ceiling runners leaving space for movement. Anchor studs at partition intersections, partition corners and where partition abuts other construction to floor and ceiling runners with sheet metal screws through each stud flange and runner flange.
 3. Connection at ceiling runner for non-rated partitions shall be snap-in or slotted hole slip joint bolt connection that shall allow for movement. Seal studs abutting other construction with 1/8" thick neoprene gasket continuously between stud and abutting construction.
 4. Connections for fire rated partitions at ceiling runners shall conform to UL Design #2079.
 5. Install metal stud horizontal bracing wherever vertical studs are cut or wallboard is cut for passage of pipes, ducts or other penetrations, and anchor horizontal bracing

to vertical studs with sheet metal screws.

6. At jambs of door frames and borrowed light frames, install doubled-up studs (not back to back) from floor to underside of structural deck, and securely anchor studs to jamb anchors of frames and to runners with screws. Provide cross braces from hollow metal frames to underside of slab.
 7. Over heads of door frames, install cut-to-length section of runner with flanges slit and web bent to allow flanges to overlap adjacent vertical studs, and securely anchor runner to adjacent vertical studs with sheet metal screws. Install cut-to-length vertical studs from runner (over heads of door frame) to ceiling runner sixteen (16) inches maximum o.c. and at vertical joints of wallboard, and securely anchor studs to runners with sheet metal screws.
 8. At control joints, in field of partition, install double-up studs (back to back) from floor to ceiling runner, with 1/4" thick continuous compressible gasket between studs. When necessary, splice studs with eight (8) inches minimum nested laps and attach flanges together with two (2) sheet metal screws in each flange. All screws shall be self-tapping sheet metal screws.
- D. Runners and Studs at Chase Wall: As specified above for "Runners" and "Studs" and as specified herein. Chase walls shall have either a single or double row of floor and ceiling runners with metal studs sixteen (16) inches o.c. maximum and positioned vertically in the runners so that the studs are opposite each other in pairs with the flanges pointing in the same direction. Anchor all studs to runner flanges with sheet metal screws through each stud flange and runner flange following requirements of paragraph 3.4, B. Provide cross bracing between the rows of studs by attaching runner channels or studs set full width of chase attached to vertical studs with one self-tapping screw at each end. Space cross bracing not over thirty-six (36) inches o.c. vertically.
- E. Wallboard Installation - Single Layer Application (Screw Attached)
1. Install wallboard with long dimension parallel to framing member and with abutting edge joints over web of framing member. Install wallboard with long dimension perpendicular to framing members above and below openings in drywall extending to second stud at each side of opening. Joints on opposite sides of wall shall be arranged so as to occur on different studs.
 2. Boards shall be fastened securely to metal studs with screws as specified. Where a free end occurs between studs, back blocking shall be required. Center abutting ends over studs. Correct work as necessary so that faces of boards are flush, smooth, true.
 3. Wallboard screws shall be applied with an electric screw gun. Screws shall be driven not less than 3/8" from ends or edges of board to provide uniform dimple not over 1/32" deep. Screws shall be spaced twelve (12) inches o.c. in the field of the board and 8" o.c. staggered along the abutting edges.
 4. All ends and edges of wallboard shall occur over screwing members (studs or furring channels). Boards shall be brought into contact but shall not be forced into place. Where ends or edges abut, they shall be staggered. Joints on opposite sides of a partition shall be so arranged as to occur on different studs.
 5. At locations where piping receptacles, conduit, switches, etc., penetrate drywall partitions, provide non-drying sealant and an approved sealant stop at cut board locations inside partition.

F. Wallboard Installation - Double-Layer Application

1. General: See drawings for wallboard partition types required.
2. First Layer (Screw Attached): Install as described above for single layer application.
3. Second Layer (Screw Attached): Screw attach second layer, unless laminating method of attachment indicated on drawings or necessary to obtain required sound rating or fire rating. Install wallboard vertically with vertical joints offset thirty-two (32) inches from first layer joints and staggered on opposite sides of wall. Attach wallboard with 1-5/8" screws sixteen (16) inches o.c. along vertical joints and sixteen (16) inches o.c. in the field of the wallboard. Screw through first layer into metal framing members.
4. Second Layer (Laminated): Install wallboard vertically. Stagger joints of second layer from first layer joints. Laminate second layer with specified laminating adhesive in beads or strips running continuously from floor to ceiling in accordance with manufacturer's instructions. After laminating, screw wallboard to framing members with 1-5/8" screws, spaced twelve (12) inches o.c. around perimeter of wallboard.

- G. Wallboard Installation - Laminated Application: Where laminated wallboard is indicated, use specified laminating adhesive, install wallboard vertically and maintain tolerances as specified for screw attached wallboard.
- H. Insulation Installation: Install where indicated on drawings. Place blanket tightly between studs.
- I. Deflection of Structure Above: To allow for possible deflection of structure above partitions, provide top runners for non-rated partitions with 1-1/4" minimum flanges and do not screw studs or drywall to top runner. Where positive anchorage of studs to top runner is required, anchorage device shall be by means of slotted hole (in clip connection with screw attachment to web of steel through bushings located in slots of clips), or other anchorage device approved by Architect.
- J. Control Joints
 1. Leave a 1/2" continuous opening between gypsum boards for insertion of surface mounted joint.
 2. Back by double framing members.
 3. Attach control joint to face layer with 9/16" galvanized staples six (6) inches o.c. at both flanges along entire length of joint.
 4. Provide two (2) inch wide gypsum panel strip or other adequate seal behind control joint in fire rated partitions and partitions with safing insulation.

3.5 DRYWALL CEILINGS

- A. Furnish and install inserts, hanger clips and similar devices in coordination with other work.
- B. Secure hangers to inserts and clips. Clamp or bolt hangers to main runners.
- C. Space main runners 4'-0" o.c. and space hangers 4'-0" o.c. along runners, except as otherwise shown.
- D. Level main runners to a tolerance of 1/4" in 12'-0", measured both lengthwise on each runner and transversely between parallel runners.
- E. Metal Furring Channels: Space sixteen (16) inches o.c. maximum. Attach to 1-1/2" main runner channels with furring channel clips (on alternate sides of main runner channels). Furring channels shall not be let into or come in contact with abutting masonry walls. End splices shall be provided by nesting furring channels no less than eight (8) inches and securely wire tying. At any openings that interrupt the furring channels, install additional cross reinforcing to restore lateral stability.
- F. Mechanical accessories, hangers, splices, runner channels and other members used in suspension system shall be of metal, zinc coated, or coated with rust inhibitive paint, of suitable design and of adequate strength to support units securely without sagging, and such as to bring unit faces to finished indicated lines and levels.
 1. Provide special furring where ducts are over two (2) feet wide.
- G. Apply board with its long dimension at right angles to channels. Locate board butt joints over center of furring channels. Attach board with one (1) inch self-drilling drywall screws twelve (12) inches o.c. in field of board at each furring channel; eight

(8) inches o.c. at butt joints located not less than 3/8" from edges.

3.6 ERECTION AT COLUMN ENCLOSURES

- A. Metal framing supports shall be provided under work of this Section, and shall be cut to lengths as necessary for tight fit such that spacing is not more than sixteen (16) inches o.c.
- B. Board shall be fastened securely to supports with screws as specified. Place boards in position with minimum number of joints. Where free ends occur between supports, back-blocking or furring shall be required. Center abutting ends over supports. Correct work as necessary so that faces of boards are flush, smooth and true. Provide clips or cross furring for attachment as required.
- C. All layers shall be screw attached to furring.
- D. When column finish called for on drawings to be in the same plane as drywall finish layer, maintain even, level plane.

3.7 FINISHING

- A. Taping: A thin, uniform layer of compound shall be applied to all joints and angles to be reinforced. Reinforcing tape shall be applied immediately, centered over the joint, seated into the compound. A skim coat shall follow immediately, but shall not function as a fill or second coat. Tape shall be properly folded and embedded in all angles to provide a true angle.
- B. Filling: After initial coat of compound has hardened, additional compound shall be applied, filling the board taper flush with the surface. The fill coat shall cover the tape and feather out slightly beyond the tape. On joints with no taper, the fill coat shall cover the tape and feather out at least four (4) inches on either side of the tape. No fill coat is necessary on interior angles.
- C. After compound has hardened, a finishing coat of compound shall be spread evenly over and extending slightly beyond the fill coat on all joints and feathered to a smooth, uniform finish. Over tapered edges, the finished joint shall not protrude beyond the plane of the surface. All taped angles shall receive a finish coat to cover the tape and taping compound, and provide a true angle. Where necessary, sanding shall be done between coats and following the final application of compound to provide a smooth surface, ready for painting.
- D. Fastener Depressions: Compound shall be applied to all fastener depressions followed, when hardened by at least two (2) coats of compound, leaving all depressions level with the plane of the surface.
- E. Finishing Beads and Trim: Compound shall be applied to all bead and trim and shall be feathered out from the ground to the plane of the surface. When hardened, this shall be followed by two (2) coats of compound each extending slightly beyond the previous coat. The finish coat shall be feathered from the ground to the plane of the surface and sanded as necessary to provide a flat, smooth surface ready for decoration.
- F. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840.
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-

CONTRACT No. 22-523
DIVISION 9 – FINISHES

rated assemblies.

2. Level 2: Panels that are a substrate for tile, and where indicated.
 3. Levels 4: Level of finish for surfaces exposed to view shall conform to Level 4 of ASTM C 840 and GA-214 of the Gypsum Association, except as noted below.
 4. Level 5: Level of finish for the following wall or ceiling surfaces unless wall coverings are specified or noted otherwise:
 - a. Public gathering areas.
 - b. Toilet room ceilings (both public and private).
- G. Drywall construction with defects of such character which will mar appearance of finished work, or which is otherwise defective, will be rejected and shall be removed and replaced at no expense to the Owner.

3.8 CLEANING AND ADJUSTMENT

- A. At the completion of installation of the work, all rubbish shall be removed from the building leaving floors broom clean. Excess material, scaffolding, tools and other equipment shall be removed from the building.
- B. Work shall be left in clean condition ready for painting or wall covering. All work shall be as approved by Architect.
- C. Cutting and Repairing: Include all cutting, fitting and repairing of the work included herein in connection with all mechanical trades and all other trades which come in conjunction with any part of the work, and leave all work complete and perfect after all trades have completed their work.

3.9 PROTECTION OF WORK

- A. Installer shall advise Contractor of required procedures for protecting drywall work from damage and deterioration during remainder of construction period.

END OF SECTION

SECTION 09 30 13 - CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ceramic mosaic tile.
2. Ceramic wall tile and base
3. Waterproof membrane
4. Metal edge strips.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples:

1. Each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide samples of each color blend.
2. 6" length of metal edge strips
3. 12" x 12" samples of waterproofing membrane

C. Master Grade Certificates: Prior to opening ceramic tile containers, submit to the Architect a Master Grade Certificate, signed by an officer of the firm manufacturing the ceramic tile used, and issued when the shipment is made, stating the grade, kind of tile, identification marks for tile containers, and the name and location of the project.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as 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.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

CONTRACT No. 22-523
DIVISION 9 – FINISHES

1. For cutting, installing, and grouting of ceramic tile use only thoroughly trained and experienced journeyman tile setters who are completely familiar with the requirements of this work, and the recommendations contained in the referenced standards, and the installers are Certified Ceramic Tile Installer (CTI) through the Ceramic Tile Education Foundation (CTEF) or Tile Installer Thin Set Standards (ITS) verification through the University of Ceramic Tile and Stone..
- B. 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 of each type of wall tile installation.
 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide Standard-grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

2.2 TILE PRODUCTS

- A. Tile:
 1. See Finish Schedule for basis of design products. The Architect reserves the right to pick tile from any price group.
- B. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile.

2.3 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

2.4 SETTING MATERIALS

- A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.
- B. Standard Dry-Set Mortar (Thinset): ANSI A118.1.

CONTRACT No. 22-523
DIVISION 9 – FINISHES

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Custom Building Products.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
2. For wall applications, provide nonsagging mortar.

C. Modified Dry-Set Mortar (Thinset): ANSI A118.4.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Custom Building Products.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
2. Provide prepackaged, dry-mortar mix combined with liquid-latex additive at Project site.
3. For wall applications, provide nonsagging mortar.

D. Improved Modified Dry-Set Mortar (Thinset): ANSI A118.15.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Custom Building Products.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
2. Provide prepackaged, dry-mortar mix combined with liquid-latex additive at Project site.
3. For wall applications, provide nonsagging mortar.

E. Water-Cleanable, Tile-Setting Epoxy: ANSI A118.3.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Custom Building Products.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.

2.5 GROUT MATERIALS

A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.

B. High-Performance Tile Grout: ANSI A118.7.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Custom Building Products.
 - b. Laticrete International, Inc.

CONTRACT No. 22-523
DIVISION 9 – FINISHES

- c. MAPEI Corporation.
 2. Polymer Type: Liquid-latex form for addition to prepackaged dry-grout mix.
- C. Water-Cleanable Epoxy Grout: ANSI A118.3, with a VOC content of 65 g/L or less.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Custom Building Products.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
- D. Grout for PregROUTed Tile Sheets: Same product used in factory to pregROUT tile sheets.

2.6 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. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel, ASTM A666, 300 Series exposed-edge material.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Blanke Corporation.
 - b. Ceramic Tool Company, Inc.
 - c. Schluter Systems L.P.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, 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 (1:50) toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 CERAMIC TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
- F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Ceramic Mosaic Tile: 1/16 inch (1.6 mm).
 - 2. Glazed Wall Tile: 1/16 inch (1.6 mm).
 - 3. Porcelain Tile: 1/4 inch (6.4 mm).
- G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

CONTRACT No. 22-523
DIVISION 9 – FINISHES

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
 - I. Install tile backing panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use modified dry-set mortar for bonding material unless otherwise directed in manufacturer's written instructions.
 - J. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

END OF SECTION 093013

SECTION 09 67 23 - RESINOUS FLOORING

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. Resinous flooring system as shown on the drawings and in schedules.
- B. Related sections include the following:
 - 1. Concrete, section 03 30 00

1.3 SYSTEM DESCRIPTION

- A. The work shall consist of preparation of the substrate, the furnishing and application of a cementitious urethane based self-leveling seamless flooring system with decorative chip broadcast and Epoxy broadcast and topcoats.
- B. The system shall have the color and texture as specified by the Owner with a nominal thickness of 3/16 inch. It shall be applied to the prepared area(s) as defined in the plans strictly in accordance with the Manufacturer's recommendations.
- C. Cove base (if required) to be applied where noted on plans and per manufacturers standard details unless otherwise noted

1.4 SUBMITTALS

- A. Product Data: Latest edition of Manufacturer's literature including performance data and installation procedures.
- B. Manufacturer's Material Safety Data Sheet (MSDS) for each product being used.
- C. Samples: A 3 x 3 inch square sample of the proposed system. Color, texture, and thickness shall be representative of overall appearance of finished system subject to normal tolerances.

1.5 QUALITY ASSURANCE

- A. The Manufacturer shall have a minimum of 10 years experience in the production, sales, and technical support of epoxy and urethane industrial flooring and related materials.
- B. The Applicator shall have experience in installation of the flooring system as confirmed by the manufacturer in all phases of surface preparation and application of the product specified.
- C. System shall be in compliance with requirements of United States Department of Agriculture (USDA), Food, Drug Administration (FDA), and local Health Department.

CONTRACT No. 22-523
DIVISION 9 – FINISHES

- D. A pre-installation conference shall be held between Applicator, General Contractor and the Owner to review and clarification of this specification, application procedure, quality control, inspection and acceptance criteria and production schedule.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping

- 1. All components of the system shall be delivered to the site in the Manufacturer's packaging, clearly identified with the product type and batch number.

B. Storage and Protection

- 1. Store all components in a dry area, out of direct sunlight and in accordance with the Manufacturer's recommendations and relevant health and safety regulations.
- 2. Copies of Material Safety Data Sheets (MSDS) for all components shall be kept on site for review by the Engineer or other personnel.

1.8 PROJECT CONDITIONS

A. Site Requirements

- 1. Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application
- 2. The Applicator shall be supplied with adequate lighting equal to the final lighting level during the preparation and installation of the system.

B. Conditions of new concrete to be coated with cementitious urethane material.

- 1. Concrete shall be moisture cured for a minimum of 3 days and have fully cured a minimum of 5 days in accordance with ACI-308 prior to the application of the coating system pending moisture tests.
- 2. Concrete shall have a flat rubbed finish, float or light steel trowel finish (a hard steel trowel finish is neither necessary nor desirable).
- 3. Sealers and curing agents should not to be used.
- 4. Concrete shall have minimum design strength of 3,500 psi. and a maximum water/cement ratio of 0.45
- 5. Concrete surfaces on grade shall have been constructed with a vapor barrier to protect against the effects of vapor transmission and possible delamination of the system.

C. Safety Requirements

- 1. All open flames and spark-producing equipment shall be removed from the work area prior to commencement of application.
- 2. "No Smoking" signs shall be posted at the entrances to the work area.

PART 2 – PRODUCTS

2.1 FLOORING

- A. Resinous Flooring System: Abrasion-, impact-, and chemical-resistant, aggregate-filled, resin-based monolithic floor surfacing designed to produce a seamless floor.
- B. Basis-of-Design Product: Hybri-Flex EC (self leveling chip broadcast), epoxy/aliphatic urethane topcoat seamless flooring system as manufactured by Dur-A-Flex, Inc., 95 Goodwin Street, East Hartford, CT 06108, Phone: (860) 528-9838, Fax: (860) 528-2802
 - 1. System Materials:
 - a. Topping: Dur-A-Flex, Inc, Poly-Crete SL resin, hardener and SL aggregate.
 - b. The broadcast aggregate shall be Dur-A-Flex, Inc. Macro chip
 - c. Broadcast: Dur-A-Flex, Inc. Dur-A-Glaze #4, epoxy based two-component resin.
 - d. Groutcoat: Dur-A-Flex, Inc Dur-A-Glaze #4, epoxy-based, two-component resin.
 - e. Top coat: Dur-A-Flex, Inc. Armor Top aliphatic urethane 2 component resin with grit.
 - 2. Patch Materials
 - a. Shallow Fill and Patching: Use Dur-A-Flex, Inc. Poly-Crete MD (up to ¼ inch).
 - b. Deep Fill and Sloping Material (over ¼ inch): Use Dur-A-Flex, Inc. Poly-Crete WR.
- C. Or Approved Comparable product
- D. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Obtain secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from manufacturer recommended in writing by manufacturer of primary materials.

2.2 PRODUCT REQUIREMENTS

A. Topping :

Basis-of-Design Product: Poly-Crete SL

- | | |
|----------------------------------------------|---------------------------|
| 1. Percent Reactive | 100 % |
| 2. VOC | 0 g/L |
| 3. Bond Strength to Concrete ASTM D 4541 | 400 psi, substrates fails |
| 4. Compressive Strength, ASTM C 579 | 9,000 psi |
| 5. Tensile Strength, ASTM D 638 | 2,175 psi |
| 6. Flexural Strength, ASTM D 790 | 5,076 psi |
| 7. Impact Resistance @ 125 mils, MIL D-3134, | 160 inch lbs |
| No visible damage or deterioration | |

B. Broadcast Coat:

Basis-of-Design Product : Dur-A-Glaze #4 Resin

CONTRACT No. 22-523
DIVISION 9 – FINISHES

- | | |
|----------------------------------------------------|--------------------|
| 1. Percent Reactive, | 100 % |
| 2. VOC | <4 g/L |
| 3. Water Absorption, ASTM D 570 | 0.04% |
| 4. Tensile Strength, ASTM D 638 | 4000psi |
| 5. Coefficient of thermal expansion
ASTM D 696, | 2 x 10-5 in/in/F |
| 6. Flammability ASTM D-635 | Self-Extinguishing |
| 7. Flame Spread/ NFPA 101 ASTM E-84 | Class A |

C. Grout Coat:

Basis-of-Design Product: Dur-A-Glaze 4 Waterclear Resin

- | | |
|----------------------------------------------------|--------------------|
| 1. Percent Reactive, | 100 % |
| 2. VOC | <4 g/L |
| 3. Water Absorption, ASTM D 570 | 0.04% |
| 4. Tensile Strength, ASTM D 638 | 4000psi |
| 5. Coefficient of thermal expansion
ASTM D 696, | 2 x 10-5 in/in/F |
| 6. Flammability ASTM D-635 | Self-Extinguishing |
| 7. Flame Spread/ NFPA 101 ASTM E-84 | Class AD. |

D. Topcoat :

Basis-of-Design Product : Armor Top

- | | |
|-------------------------------------------------------------------------------|--------------------------------------------------------------------|
| 1. VOC | 0 g/L |
| 2. 60 Degree Gloss ASTM D523 | 75+/-5 |
| 3. Mixed Viscosity, (Brookfield 25oC) | 500 cps |
| 4. Tensile strength, ASTM D 638 | 7,000 psi |
| 5. Abrasion Resistance, ASTM D4060
CS 17 wheel (1,000 g load) 1,000 cycles | Gloss Satin
4 8 mg loss with grit
10 12 mg loss without grit |
| 6. Pot life @ 70o F 50% RH | 2 hours |
| 7. Dry properties, 70oF, 50% R.H. | 8 hours tack free, 12 hours Dry |
| 60oF, 30% RH | 12 hours tack free, 18 hours Dry |
| 80oF, 70%RH | 4 hours tack free, 6 hours Dry |
| 8. Flash Point PMCC | 186oF |
| 9. Full Chemical resistance | 7 days |

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas and conditions, with Applicator present, for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting flooring performance.
1. Verify that substrates and conditions are satisfactory for flooring installation and comply with requirements specified.

3.2 PREPARATION

A. General

1. New and existing concrete surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, and bituminous products.
2. Moisture Testing: Perform tests recommended by manufacturer and as follows.
 - a. Perform anhydrous calcium chloride test ASTM F 1869-98. Application will proceed only when the vapor/moisture emission rates from the slab is less than and not higher than 20 lbs/1,000 sf/24 hrs.
 - b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 99% relative humidity level measurement.
 - c. If the vapor drive exceeds 99% relative humidity or 20 lbs/1,000 sf/24 hrs then the Owner and/or Engineer shall be notified and advised of additional cost for the possible installation of a vapor mitigation system that has been approved by the manufacturer or other means to lower the value to the acceptable limit.
3. Mechanical surface preparation
 - a. Shot blast all surfaces to receive flooring system with a mobile steel shot, dust recycling machine (Blastrac or equal). All surface and embedded accumulations of paint, toppings hardened concrete layers, laitance, power trowel finishes and other similar surface characteristics shall be completely removed leaving a bare concrete surface having a minimum profile of CSP 4-5 as described by the International Concrete Repair Institute.
 - b. Floor areas inaccessible to the mobile blast machines shall be mechanically abraded to the same degree of cleanliness, soundness and profile using diamond grinders, needle guns, bush hammers, or other suitable equipment.
 - c. Where the perimeter of the substrate to be coated is not adjacent to a wall or curb, a minimum 1/4 inch key cut shall be made to properly seat the system, providing a smooth transition between areas. The detail cut shall also apply to drain perimeters and expansion joint edges.
 - d. Cracks and joints (non-moving) greater than 1/8 inch wide are to be chiseled or chipped-out and repaired per manufacturer's recommendations.
4. At spalled or worn areas, mechanically remove loose or delaminated concrete to a sound concrete and patch per manufacturer's recommendations.

3.3 APPLICATION

A. General

1. The system shall be applied in five distinct steps as listed below:

CONTRACT No. 22-523
DIVISION 9 – FINISHES

- a. Substrate preparation
 - b. Topping/overlay application with chip broadcast.
 - c. Resin application with chip broadcast.
 - d. Grout Coat application
 - e. Topcoat application.
2. Immediately prior to the application of any component of the system, the surface shall be dry and any remaining dust or loose particles shall be removed using a vacuum or clean, dry, oil-free compressed air.
 3. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations.
 4. The system shall follow the contour of the substrate unless pitching or other leveling work has been specified by the Architect.
 5. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.

B. Topping

1. The topping shall be applied as a self-leveling system as specified by the Architect. The topping shall be applied in one lift with a nominal thickness of 1/8 inch.
2. The topping shall be comprised of three components, a resin, hardener and filler as supplied by the Manufacturer.
3. The hardener shall be added to the resin and thoroughly dispersed by suitably approved mechanical means. SL Aggregate shall then be added to the catalyzed mixture and mixed in a manner to achieve a homogenous blend.
4. The topping shall be applied over horizontal surfaces using ½ inch “v” notched squeegee, trowels or other systems approved by the Manufacturer.
5. Immediately upon placing, the topping shall be degassed with a loop roller.
6. Chip aggregate shall be broadcast to excess into the wet resin, Macro chip at the rate of 0.1 lbs/sf
7. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose chips.

C. Broadcast

1. The broadcast coat resin shall be applied at the rate of 100 sf/gal.
2. The broadcast coat shall be comprised of liquid components, combined at a ratio of 2 parts resin to 1 part hardener by volume and shall be thoroughly blended by mechanical means such as a high speed paddle mixer.
3. Chip aggregate shall be broadcast into the wet resin, Macro chips at the rate of 0.1 lbs/sf,
4. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose chips.

D. Grout Coat

1. The grout coat shall be squeegee applied with a coverage rate of 100 sf/gal.
2. The topcoat shall be comprised of liquid components, combined at a ratio of 2 parts resin to 1 part hardener by volume and shall be thoroughly blended by mechanical means such as a high speed paddle mixer.
3. The grout coat will be back rolled and cross rolled to provide a uniform texture and finish

CONTRACT No. 22-523
DIVISION 9 – FINISHES

E. Top Coat

1. Thetopcoat with grit shall be roller applier with a coverage rate of 500 sf/gal.
2. The finish floor will have a nominal thickness of 3/16 inch.

3.4 FIELD QUALITY CONTROL

A. Tests, Inspection

1. The following tests shall be conducted by the Applicator:
 - a. Temperature
 1. Air, substrate temperatures and, if applicable, dew point.
 - b. Coverage Rates
 1. Rates for all layers shall be monitored by checking quantity of material used against the area covered.

3.5 CLEANING AND PROTECTION

- A. Cure flooring material in compliance with manufacturer's directions, taking care to prevent their contamination during stages of application and prior to completion of the curing process.
- B. Remove masking. Perform detail cleaning at floor termination, to leave cleanable surface for subsequent work of other sections.

END OF SECTION

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SECTION 09 91 00 - PAINTING AND FINISHING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the painting and finishing as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Prime painting unprimed surfaces to be painted under this Section.
 - 2. Painting all items furnished with a prime coat of paint, including touching up of or repairing of abraded, damaged or rusted prime coats applied by others.
 - 3. Painting all ferrous metal (except stainless steel) exposed to view.
 - 4. Painting all galvanized ferrous metals exposed to view.
 - 5. Painting architectural PVC, plastic, and fiberglass.
 - 6. Painting of wood exposed to view, except items which are specified to be painted or finished under other Sections of these specifications. Back painting of all wood in contact with concrete, masonry or other moisture areas.
 - 7. Painting pipes, pipe coverings, conduit, ducts, insulation, hangers, supports and other mechanical and electrical items and equipment exposed to view.
 - 8. Painting surfaces above, behind or below grilles, gratings, diffusers, louvers, lighting fixtures, and the like, which are exposed to view through these items.
 - 9. Incidental painting and touching up as required to produce proper finish for painted surfaces, including touching up of factory finished items.
 - 10. Painting of any surface not specifically mentioned to be painted herein or on drawings, but for which painting is obviously necessary to complete the job, or work which comes within the intent of these specifications, shall be included as though specified.

1.3 RELATED SECTIONS

- A. Shop priming is required on some, but not all of the items scheduled to be field painted. Refer to other Sections of work for complete description.
- B. Shop Coat on Machinery and Equipment: Refer to the Sections under which various items of manufactured equipment with factory applied shop prime coats are furnished, including, but not necessarily limited to, the following Sections. All items of equipment furnished with prime coat finish shall be finish painted under this Section.

1. Plumbing - Division 22.
2. Heating, Ventilation and Air Conditioning - Division 23.

1.4 MATERIALS AND EQUIPMENT NOT TO BE PAINTED

- A. Items of equipment furnished with complete factory finish, except for items specified to be given a finish coat under this Section.
- B. Non-ferrous metals, except for items specified and/or indicated to be painted.
- C. Finished hardware, excepting hardware that is factory primed.
- D. Surfaces not to be painted shall be left completely free of droppings and accidentally applied materials resulting from the work of this Section.

1.5 QUALITY ASSURANCE

- A. Job Mock-Up
 1. In addition to the samples specified herein to be submitted for approval, apply in the field, at their final location, each type and color of approved paint materials, applied 10 feet wide, floor to ceiling of wall surfaces, before proceeding with the remainder of the work, for approval by the Architect. Paint mock-ups to include door and frame assembly.
 2. These applications when approved will establish the quality and workmanship for the work of this Section.
 3. Repaint individual areas which are not approved, as determined by the Architect, until approval is received. Assume at least two paint mock-ups of each color and gloss for approval.
- B. Qualification of Painters: Use only qualified journeyman painters for the mixing and application of paint on exposed surfaces.
- C. Paint Coordination: Provide finish coats which are compatible with the prime paints used. Review other Sections of these specifications in which prime paints are to be provided to ensure compatibility of the total coatings system for the various substrates. Upon request from other subcontractors, furnish information on the characteristics of the finish materials proposed to be used, to ensure that compatible prime coats are used. Provide barrier coats over incompatible primers or remove and re-prime as required. Notify the Architect in writing of any anticipated problems using the coating systems as specified with substrates primed by others.
- D. All paints must conform to the Volatile Organic Compounds (VOC) standards of prevailing codes and ordinances.

1.6 SUBMITTALS

- A. Materials List: Before any paint materials are delivered to the job site, submit to the Architect a complete list of all materials proposed to be furnished and installed under this portion of the work. This shall in no way be construed as permitting substitution of materials for those specified or accepted for this work by the Architect.
- B. Samples

1. Accompanying the materials list, submit to the Architect copies of the full range of colors available in each of the proposed products.
 2. Upon direction of the Architect, prepare and deliver to the Architect two (2) identical sets of Samples of each of the selected colors and glosses painted onto 8-1/2" x 11" x 1/4" thick material; whenever possible, the material for Samples shall be the same material as that on which the coating will be applied in the work.
- C. Manufacturer's Recommendations: In each case where material proposed is not the material specified or specifically described as an acceptable alternate in this Section of these specifications, submit for the Architect's review the current recommended method of application published by the manufacturer of the proposed material.
- D. Closeout Submittal
1. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual such as Sherwin Williams "Custodian Project Color and Product Information" report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, MSDS, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.7 PRODUCT HANDLING

- A. Deliver all paint materials to the job site in their original unopened containers with all labels intact and legible at time of use.
- B. Protection
1. Store only the approved materials at the job site, and store only in a suitable and designated area restricted to the storage of paint materials and related equipment.
 2. Use all means necessary to ensure the safe storage and use of paint materials and the prompt and safe disposal of waste.
 3. Use all means necessary to protect paint materials before, during and after application and to protect the installed work and materials of all other trades.
- C. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

1.8 EXTRA STOCK

- A. Upon completion of this portion of the Work, deliver to the Owner an extra stock of paint equaling approximately ten (10) percent of each color and gloss used and each coating material used, with all such extra stock tightly sealed in clearly labeled containers.

1.9 JOB CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 50 degrees F. and 90 degrees F., unless otherwise permitted by the paint manufacturer's printed instructions.

- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 45 degrees F. and 95 degrees F. unless otherwise permitted by the paint manufacturer's printed instructions.
- C. Do not apply paint in snow, rain, fog or mist; or when the relative humidity exceeds eighty-five (85) percent; or to damp or wet surfaces; unless otherwise permitted by the paint manufacturer's printed instructions.
- D. Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within the temperature limits specified by the paint manufacturer during application and drying periods.

PART 2 PRODUCTS

2.1 PAINT MANUFACTURERS

- A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, products listed in the Exterior Painting Schedule for the paint category indicated.
 - 1. Basis-of-Design Manufacturer: The Sherwin Williams Company
 - 2. Product Representative
 - Rebecca Smith
 - White Plains, NY
 - 516-375-1912
 - Rebecca.h.smith@sherwin.com

2.2 MATERIALS

- A. Provide undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer and use only to recommended limits.
- B. Colors and Glosses: All colors and glosses shall be as selected by the Architect. Certain colors will require paint manufacturer to prepare special factory mixes to match colors selected by the Architect. Color schedule (with gloss) shall be furnished by the Architect.
- C. Coloring Pigment: Products of or furnished by the manufacturer of the paint or enamel approved for the work.
- D. Linseed Oil: Raw or boiled, as required, of approved manufacture, per ASTM D 234 and D 260, respectively.
- E. Turpentine: Pure distilled gum spirits of turpentine, per ASTM D 13.
- F. Shellac: Pure gum shellac (white or orange) cut in pure denatured alcohol using not less than four (4) lbs. of gum per gallon of alcohol.
- G. Driers, Putty, Spackling Compound, Patching Plaster, etc.: Best quality, of approved manufacture.

- H. Heat-Resistant Paint: Where required, use heat resistant paint when applying paint to heating lines and equipment.

2.3 GENERAL STANDARDS

- A. The various surfaces shall be painted or finished as specified below in Article 2.4. However, the Architect reserves the right to change the finishes within the range of flat, semi-gloss or gloss, without additional cost to the Owner.
- B. All paints, varnishes, enamels, lacquers, stains and similar materials must be delivered in the original containers with the seals unbroken and label intact and with the manufacturer's instructions printed thereon.
- C. All painting materials shall bear identifying labels on the containers with the manufacturer's instructions printed thereon.
- D. Paint shall not be badly settled, caked or thickened in the container, shall be readily dispersed with a paddle to a smooth consistency and shall have excellent application properties.
- E. Paint shall arrive on the job color-mixed except for tinting of under-coats and possible thinning.
- F. All thinning and tinting materials shall be as recommended by the manufacturer for the particular material thinned or tinted.
- G. It shall be the responsibility of the Contractor to see that all mixed colors match the color selection made by the Architect prior to application of the coating.

2.4 PAINTING SCHEDULE

- A. High Performance Coating on Exterior Galvanized Ferrous Metals

First Coat: "PittGuard Rapid Coat Epoxy 95-245 Series by PPG, "Series 27WB Typoxy" by Tnemec; "Epoxy Mastic Coating V 160" by Benjamin Moore Corotech or "Recoatable Epoxy Primer 867-45" by Sherwin Williams.

Second Coat: "Pitthane Ultra 95-812 (Gloss)" or "High Build 95-8800 (Semi-Gloss)" by PPG; "Series 1080 (gloss) Endura-Shield WB" or "Series 1081 (semi-gloss) Endura-Shield WB" by Tnemec; "Acrylic Aliphatic Urethane V 500 (Gloss)" or "V 510 (Semi-Gloss)" by Benjamin Moore Corotech or "Hi-Solids Urethane B65-300/350" by Sherwin Williams.

- B. High Performance Coating on Exterior Non-Galvanized Ferrous Metals

Prime Coat: "Amercoat 68HS Epoxy Zinc-Rich Primer" by PPG; "Series 94-H₂O Hydro-Zinc" by Tnemec; "Organic Zinc Rich Primer V 170" by Benjamin Moore Corotech or "Zinc Clad II Plus Inorganic Zinc Rich Coating B69V212" by Sherwin Williams.

Second Coat: "Pitt Guard Rapid Coat Epoxy 95-245" by PPG; "Series 27WB Typoxy" by Tnemec; "Epoxy Mastic Coating V 160" by Benjamin Moore Corotech or "Macropoxy 646 Fast Cure Epoxy B58-600" by Sherwin Williams.

Third Coat: "Pitthane Ultra 95-812 (Gloss)" or "High Build 95-8800 (Semi-Gloss)" by PPG; "Series 1070V (gloss) Fluoronar" or "Series 1071V (semi-gloss) Fluoronar" by Tnemec; "Acrylic Aliphatic Urethane V 500 (Gloss)" or "V 510

(Semi-Gloss)" by Benjamin Moore Corotech or "Hi-Solids Polyurethane B65-300/350" by Sherwin Williams.

- C. Wood Substrates: Exterior and semi-protected siding, trim, exposed lumber and wood-based panel products. Substrates include new and previously-painted surfaces.
 - 1. Latex System, Satin Finish (unless otherwise noted)
 - a. Prime Coat: S-W Exterior Latex Wood Primer
 - b. 2nd Coat: S-W Duration Exterior Latex Satin
 - c. 3rd Coat: S-W Duration Exterior Latex Satin
 - 2. Latex System, Gloss Finish (where indicated)
 - a. Prime Coat: S-W Exterior Latex Wood Primer
 - b. 2nd Coat: S-W Duration Exterior Latex Gloss
 - c. 3rd Coat: S-W Duration Exterior Latex Gloss
- D. Wood Substrates: Non-vehicular skyward-facing decks, floors, ramps, steps & platforms. Substrates include new and previously-painted surfaces. System includes field painting as well as directional, edge, and warning markings.
 - 1. Acrylic System, Semi-gloss finish
 - a. 1st Coat: Armorseal Treadplex 100% Water Based Floor Coating
 - b. 2nd Coat: Armorseal Treadplex 100% Water Based Floor Coating
- E. Architectural PVC, Plastic, and Fiberglass
 - 1. Latex System, Satin Finish (unless otherwise noted)
 - a. Prime Coat: Extreme Bond Interior/Exterior Bonding Primer
 - b. 2nd Coat: S-W Duration Exterior Latex Satin
 - c. 3rd Coat: S-W Duration Exterior Latex Satin
 - 2. Latex System, Gloss Finish (where indicated)
 - a. Prime Coat: Extreme Bond Interior/Exterior Bonding Primer
 - b. 2nd Coat: S-W Duration Exterior Latex Gloss
 - c. 3rd Coat: S-W Duration Exterior Latex Gloss
- F. Cementitious Substrates: Stucco, Cast Stone or Cast-in-Place concrete
 - 1. Self-Cleaning Acrylic System
 - a. Prime Coat: S-W Loxon Concrete & Masonry Primer
 - b. 2nd Coat: S-W Loxon Self-Cleaning Acrylic
 - c. 3rd Coat: S-W Loxon Self-Cleaning Acrylic
- G. Cement Masonry Substrates: CMU or Cinder Block
 - 1. Self-Cleaning Acrylic System

CONTRACT No. 22-523
DIVISION 9 – FINISHES

- a. Prime Coat: S-W Loxon Acrylic Block Surfacer
 - b. 2nd Coat: S-W Loxon Self-Cleaning Acrylic
 - c. 3rd Coat: S-W Loxon Self-Cleaning Acrylic
- H. Cement Substrates: Non-vehicular skyward-facing floors, walkways, steps, etc. System includes field painting as well as directional, edge, and warning markings.
- 1. Acrylic water-based system, semi-gloss.
 - a. 1st Coat: Armorseal Treadplex 100% Water Based Floor Coating
 - b. 2nd Coat: Armorseal Treadplex 100% Water Based Floor Coating
- I. Ferrous Metal Substrates: Exterior and interior hollow metal doors and frames and other ferrous architectural surfaces such as the drum-boxes of roll-up gates.
- 1. Latex System, semi-gloss.
 - a. Prime Coat: S-W Pro Industrial Pro-Cryl Universal Primer
 - b. 2nd Coat: S-W Pro Industrial Water-based Alkyd Urethane Enamel
 - c. 3rd Coat: S-W Pro Industrial Water-based Alkyd Urethane Enamel
- J. Ferrous Metal Substrates: Iron, ornamental iron, exposed ferrous plates, bolts and other fasteners, and structural steel where performance-level corrosion resistance is required.
- 1. High Performance Epoxy/Urethane System, semi-gloss.
 - a. 1st Coat: S-W Macropoxy 646-100
 - b. 2nd Coat: S-W Waterbased Acrolon 100 Polyurethane
 - c. 3rd Coat: S-W Waterbased Acrolon 100 Polyurethane
- K. Interior panel products: Including cement board, gypsum board, and wood-based panel products
- 1. Latex system, eggshell finish
 - a. 1st Coat: S-W ProMar 200 Zero VOC Latex Primer
 - b. 2nd Coat: S-W Solo Interior/Exterior Eg-Shel
 - c. 3rd Coat: S-W Solo Interior/Exterior Eg-Shel
- L. Wood substrates: Interior wood doors, wood trim, etc.
- 1. Acrylic Alkyd Urethane Enamel System, semi-gloss
 - a. Prime Coat: S-W Premium Wall & Wood Latex Primer
 - b. 2nd Coat: S-W Pro Industrial Water-based Alkyd Urethane Enamel
 - c. 3rd Coat: S-W Pro Industrial Water-based Alkyd Urethane Enamel

2.5 EXISTING SURFACES TO BE PAINTED

- A. Existing surfaces shall be painted in accordance with schedule given in Article 2.4 herein except that first or prime coat may be eliminated where existing paint is sound. Where existing paint must be removed down to base material, provide first or prime coat as specified.

2.6 PIPING AND MECHANICAL EQUIPMENT EXPOSED TO VIEW

- A. Paint all exposed piping, conduits, ductwork and mechanical and electrical equipment. Use heat resisting paint when applied to heating lines and equipment. The Contractor is cautioned not to paint or otherwise disturb moving parts in the mechanical systems. Mask or otherwise protect all parts as required to prevent damage.
- B. Exposed Uncovered Ductwork, Piping, Hangers and Equipment: Latex Enamel Undercoater and one (1) coat Acrylic Latex Flat.
- C. Exposed Covered Piping, Duct Work and Equipment: Primer/Sealer and one (1) coat Acrylic Latex Flat.
- D. Panel Boards, Grilles and Exposed Surfaces of Electrical Equipment: Latex Enamel Undercoater and two (2) coats Latex Semi-Gloss.
- E. Equipment or Apparatus with Factory-Applied Paint: Refinish any damaged surfaces to match original finish. Do not paint over name plates and labels.
- F. All surfaces of insulation and all other work to be painted shall be wiped or washed clean before any painting is started.
- G. All conduit, boxes, distribution boxes, light and power panels, hangers, clamps, etc., are included where painting is required.
- H. All items of Mechanical and Electrical trades which are furnished painted under their respective Contracts shall be carefully coordinated with the work of this Section so as to leave no doubt as to what items are scheduled to be painted under this Section.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where painting and finishing are to be applied and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 GENERAL WORKMANSHIP REQUIREMENTS

- A. Only skilled mechanics shall be employed. Application may be by brush or roller. Spray application only upon acceptance from the Architect in writing.
- B. The Contractor shall furnish the Architect a schedule showing when he expects to have completed the respective coats of paint for the various areas and surfaces. This schedule shall be kept current as the job progresses.
- C. The Contractor shall protect his work at all times and shall protect all adjacent work and materials by suitable covering or other method during progress of his work. Upon completion of the work, he shall remove all paint and varnish spots from floors, glass and other surfaces. He shall remove from the premises all rubbish and accumulated materials of whatever nature not caused by others and shall leave his part of the work in clean, orderly and acceptable condition.

- D. Remove and protect hardware, accessories, device plates, lighting fixtures, and factory finished work, and similar items, or provide ample in place protection. Upon completion of each space, carefully replace all removed items by workmen skilled in the trades involved.
- E. Remove electrical panel box covers and doors before painting walls. Paint separately and re-install after all paint is dry.
- F. All materials shall be applied under adequate illumination, evenly spread and flowed on smoothly to avoid runs, sags, holidays, brush marks, air bubbles and excessive roller stipple.
- G. Coverage and hide shall be complete. When color, stain, dirt or undercoats show through final coat of paint, the surface shall be covered by additional coats until the paint film is of uniform finish, color, appearance and coverage, at no additional cost to the Owner.
- H. All coats shall be dry to manufacturer's recommendations before applying succeeding coats.

3.3 PREPARATION OF SURFACES

- A. Existing Surfaces: Clean existing surfaces requiring paint or finishing, remove all loose and flaking paint or finish and sand surface smooth as required to receive new paint or finish. No telegraphing of lines, ridges, flakes, etc., through new surfacing is permitted. Where this occurs, Contractor shall be required to sand smooth and re-finish until surface meets with Architect's approval.
- B. General
 - 1. The Contractor shall be held wholly responsible for the finished appearance and satisfactory completion of painting work. Properly prepare all surfaces to receive paint, which includes cleaning, sanding, and touching-up of all prime coats applied under other Sections of the work. Broom clean all spaces before painting is started. All surfaces to be painted or finished shall be perfectly dry, clean and smooth.
 - 2. Perform all preparation and cleaning procedures in strict accordance with the paint manufacturer's instructions and as herein specified, for each particular substrate condition.
 - 3. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease with clean cloths and cleaning solvents prior to mechanical cleaning. Program the cleaning and painting so that dust and other contaminants from the cleaning process will not fall in wet, newly painted surfaces.
- C. Metal Surfaces
 - 1. Weld Fluxes: Remove weld fluxes, splatters, and alkali contaminants from metal surfaces in an approved manner and leave surface ready to receive painting.
 - 2. Bare Metal: Thoroughly clean off all foreign matter such as grease, rust, scale and dirt before priming coat is applied. Clean surfaces, where solder flux has been used, with benzene. Clean surfaces by flushing with mineral spirits. For aluminum surfaces, wipe down with an oil free solvent prior to application of any pre-treatment.
 - a. Bare metal to receive high performance coating specified herein must be blast cleaned SSPC SP-6 prior to application if field applied primer; coordinate with steel trades furnishing ferrous metals to receive this coating to insure that this cleaning method is followed.

3. Shop Primed Metal: Clean off foreign matter as specified for "Bare Metal." Prime bare, rusted, abraded and marred surfaces with approved primer after proper cleaning of surfaces. Sandpaper all rough surfaces smooth.
 4. Galvanized Metal: Prepare surface as per the requirements of ASTM D 6386.
 5. Metal Filler: Fill dents, cracks, hollow places, open joints and other irregularities in metal work to be painted with an approved metal filler suitable for the purpose and meeting the requirements of the related Section of work; after setting, sand to a smooth, hard finish, flush with adjoining surface.
- D. Wood Surfaces: Sand to remove all roughness, loose edges, splinters, or splinters and then brush to remove dust. Wash off grease or dirt with an approved cleaner. Fill all cracks, splits, nail holes, screw holes, and surface defects with putty after the priming coat has been applied. Putty shall be brought up flush with the surface and sanded smooth and touched-up with primer when dry.
- E. Touch-Up: Prime paint all patched portions in addition to all other specified coats.

3.4 MATERIALS PREPARATION

- A. Mix and prepare painting materials in strict accordance with the manufacturer's directions.
- B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing, and application of paint in a clean condition, free of foreign materials and residue.
- C. Stir all materials before application to produce a mixture of uniform density, and as required during the application of the materials. Do not stir any film which may form on the surface into the material. Remove the film and, if necessary, strain the material before using.
- D. Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are to be applied. Tint undercoats to match the color of the finish coat; provide sufficient difference in shade of undercoats to distinguish each separate coat.

3.5 APPLICATION

- A. General
 1. Apply paint by brush or roller in accordance with the manufacturer's directions. Use brushes best suited for the type of material being applied. Use rollers of carpet, velvet back, or high pile sheep's wool as recommended by the paint manufacturer for material and texture required.
 2. The number of coats and paint film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has completely dried. Sand between each enamel or varnish coat application with fine sandpaper or rub surfaces with pumice stone where required to produce an even, smooth surface in accordance with the coating manufacturer's directions.
 3. Apply additional coats when undercoats, stains, or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance. Give special

attention to insure that all surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a film thickness equivalent to that of flat surfaces.

4. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - a. "Exposed surfaces" is defined as those areas visible when permanent or built-in fixtures, convector covers, covers for finned tube radiation, grilles, etc., are in place in areas scheduled to be painted.
5. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint, before final installation of equipment.
6. Paint the back sides of access panels, removable or hinged covers to match the exposed surfaces.
7. Finish doors on tops, bottoms, and side edges the same as the faces, unless otherwise indicated.
8. Enamel finish applied to wood or metal shall be sanded with fine sandpaper and then cleaned between coats to produce an even surface.
9. Paste wood filler applied on open grained wood after beginning to flatten, shall be wiped across the grain of the wood, then with a circular motion, to secure a smooth, filled, clean surface with filler remaining in open grain only. After overnight dry, sand surface with the grain until smooth before applying specified coat.

B. Scheduling Painting

1. Apply the first coat material to surfaces that have been cleaned, pre-treated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
2. Allow sufficient time between successive coatings to permit proper drying. Do not re-coat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

C. Prime Coats: Re-coat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

D. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage.

E. Touching-Up of Factory Finishes: Unless otherwise specified or shown, materials with a factory finish shall not be painted at the project site. To touch up, the Contractor shall use the factory finished material manufacturer's recommended paint materials to repair abraded, chipped, or otherwise defective surfaces.

CONTRACT No. 22-523
DIVISION 9 – FINISHES

3.6 PROTECTION

- A. Protect work of other trades, whether to be painted or not, against damage by the painting and finishing work. Leave all such work undamaged. Correct any damages by cleaning, repairing or replacing, and repainting, as acceptable to the Architect.
- B. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

3.7 CLEAN UP

- A. During the progress of the work, remove from the site all discarded paint materials, rubbish, cans and rags at the end of each work day.
- B. Upon completion of painting work, clean window glass and other paint spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.
- C. At the completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

END OF SECTION 09 91 00

SECTION 10 14 23.16 - ROOM-IDENTIFICATION PANEL SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes room-identification signs that are directly attached to the building.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For room-identification signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
 - 3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.
- C. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

- A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

2.2 ROOM-IDENTIFICATION SIGNS

- A. Room-Identification Sign : Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
 - 1. Laminated-Sheet Sign: Photopolymer face sheet with raised graphics laminated to acrylic backing sheet to produce composite sheet.
 - a. Composite-Sheet Thickness: As indicated on Drawings.
 - b. Surface-Applied Graphics: Applied vinyl film
Color(s): As selected by Architect from manufacturer's full range.
 - 2. Sign-Panel Perimeter: Finish edges smooth.
 - a. Edge Condition: Square cut.
 - b. Corner Condition in Elevation: As indicated on Drawings.
 - 3. Mounting: Manufacturer's standard method for substrates indicated.

2.3 SIGN MATERIALS

- A. Acrylic Sheet: ASTM D4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
 - 3. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened sign unless otherwise indicated.
 - 4. Sign Mounting Fasteners:
 - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly unless otherwise indicated.
 - b. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, and installed in predrilled holes.
- B. Adhesive: As recommended by sign manufacturer.
- C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch (1.14 mm) thick, with adhesive on both sides.

2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 2. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 - 3. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
- B. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image shall be free of rough edges.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
 - 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
- B. Mounting Methods:
 - 1. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
 - 2. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

END OF SECTION 10 14 23.16

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CONTRACT No. 22-523
DIVISION 10 – SPECIALTIES

SECTION 10 28 00 - TOILET ACCESSORIES

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the toilet accessories as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Mirrors.
 - 2. Grab bars.
 - 3. Toilet accessories.
 - 4. Sensor Operated Electric hand dryers.
 - 5. Diaper-changing stations.
 - 6. Underlavatory guards.
 - 7. Custodial accessories.

1.3 RELATED SECTIONS

- A. Ceramic Tile - Section 09 30 13.
- B. Plastic Toilet Compartments - Section 10 21 13.19
- C. Electrical - Division 26.

1.4 QUALITY ASSURANCE

- A. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.
- B. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.
- C. Accessories shall be installed at heights in compliance with prevailing Handicapped Code.
- D. Products: Unless otherwise noted, provide products of same manufacturer for each type of unit and for units exposed in same areas.
- 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.

1.5 SUBMITTALS

CONTRACT No. 22-523
DIVISION 10 – SPECIALTIES

- A. Product Data: Submit manufacturer's technical data, catalog cuts and installation instructions for each toilet accessory.
- B. Setting Drawings: Provide setting drawings, templates, instructions, and directions for installation of anchorage devices in other work
- C. Submit schedule of accessories indicating quantity and location of each item.

1.6 PRODUCT HANDLING

- A. Deliver accessories to the site ready for use in the manufacturer's original and unopened containers and packaging, bearing labels as to type or material, manufacturer's name and brand name. Delivered materials shall be identical to approved samples.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 22 gauge minimum, unless otherwise indicated.
- B. Brass: ASTM B 19 flat products; ASTM B 16, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.
- D. Mirrors: ASTM C 1503, mirror glazing quality, clear glass mirrors, nominal 1/4"

2.2 FASTENING DEVICES

- A. Exposed Fasteners: Theft-proof type, chrome plated, or stainless steel; match finishes on which they are being used.
- B. Concealed Fasteners: Galvanized (ASTM A 123) or cadmium plated.
- C. No exposed fastening devices permitted on exposed frames. For metal stud drywall partitions, provide ten (10) gauge galvanized sheet concealed anchor plates for securing surface mounted accessories.

2.3 FABRICATION

- A. General: Stamped names or labels on exposed faces of toilet accessory units are not permitted. Unobtrusive labels on surfaces not exposed to view are acceptable. Where locks are required for a particular type of toilet accessory, provide same keying throughout project. Furnish two keys for each lock.
- B. Surface-Mounted Toilet Accessories, General: Fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage.
- C. Recessed Toilet Accessories, General: Fabricate units of all welded construction, without mitered corners. Hang doors of access panels with full-length stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.

CONTRACT No. 22-523
DIVISION 10 – SPECIALTIES

- D. Diaper-Changing Station: As manufactured by Medclinics; Horizontal surface-mounted baby changing station made of bacterial-resistant polypropylene with stainless steel exterior, child protection straps and a pair of bag hooks. Diaper-changing table shall be engineered to support a minimum of 200 lb. static load when opened.
- E. Underlavatory Guard: Insulating Piping Coverings: White, antimicrobial, molded-vinyl covering for supply and drain piping assemblies intended for use at accessible lavatories to prevent direct contact with and burns from piping. Provide components as required for applications indicated with flip tops at valves that allow service access without removing coverings.
- F. Warm-Air Dryer: Surface Mounting Automatic-Sensor activated hand dryer with white epoxy painted metal cover, model XL-W as manufactured by Xlerator.

2.4 MANUFACTURERS

- A. Provide products manufactured by Bobrick Washroom Equipment Co., American Specialties, Inc., Bradley Corp., A & J Washroom Accessories, or approved equal.

2.5 ACCESSORY SCHEDULE

- A. As scheduled on the drawings.

PART 3 - EXECUTION

3.1 INSPECTION

Examine the areas and conditions where toilet accessories are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 PREPARATION

- A. Accessories that are to be partition mounted shall be closely coordinated with other trades, so that the necessary reinforcing is provided to receive the accessories.
- B. Furnish templates and setting drawings and anchor plates required for the proper installation of the accessories at gypsum drywall and masonry partitions. Coordinate the work to assure that base plates and anchoring frames are in the proper position to secure the accessories.
- C. Verify by measurements taken at the job site those dimensions affecting the work. Bring field dimensions that are at variance with those on the approved shop drawings to the attention of the Architect. Obtain decision regarding corrective measures before the start of fabrication of items affected.
- D. Cooperate in the coordination and scheduling of the work of this Section with the work of other Sections so as not to delay job progress.

3.3 INSTALLATION

- A. Install accessories at locations indicated on the drawings, using skilled mechanics, in a

CONTRACT No. 22-523
DIVISION 10 – SPECIALTIES

plumb, level and secure manner.

- B. Concealed anchor assemblies for gypsum drywall partitions shall be securely anchored to metal studs to accommodate accessories. Assemblies shall consist of plates and/or angles tack welded to studs.
- C. Secure accessories in place, at their designated locations by means of theft-proof concealed set screws, so as to render removing of the accessory with a screwdriver impossible.
- D. Unless otherwise indicated, accessories shall conform to heights from the finished floor as shown on the drawings. Where locations are not indicated, such locations shall be as directed by the Architect.
- E. Installed accessories shall operate quietly and smoothly for use intended. Doors and operating hardware shall function without binding or unnecessary friction. Dispenser type accessories shall be keyed alike. Prior to final acceptance, master key and one duplicate key shall be given to Owner's authorized agent.
- F. The Architect shall be the sole judge of workmanship. Workmanship shall be of the highest quality. Open joints, weld marks, poor connections, etc., will not be permitted. The Architect has the right to reject any accessory if he feels the workmanship is below the standards of this project.
- G. Grab bars shall be installed so that they can support a three hundred (300) lb. load for five minutes per ASTM F 446.

3.4 CLEANING AND PROTECTION

- A. Upon completion of the installation, clean accessories of dirt, paint and foreign matter.
- B. During the installation of accessories and until finally installed and accepted, protect accessories with gummed canvas or other means in order to maintain the accessories in acceptable condition.
- C. Replace and/or repair any damaged or defective work to the Owner's satisfaction, and at no additional cost to the Owner,.

END OF SECTION

SECTION 10 44 16 - FIRE EXTINGUISHERS AND CABINETS

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. The Work of this Section includes all labor, materials, equipment, and services necessary to complete the fire extinguishers and cabinets as shown on the drawings and/or specified herein.

1.3 RELATED SECTIONS

- A. Section 092900, “Gypsum Board.”

1.4 QUALITY ASSURANCE

- A. Provide portable fire extinguishers, cabinets and accessories by one manufacturer.
- B. UL-Listed Products: Provide new portable fire extinguishers which are UL-listed and bear UL “Listing Mark” for type, rating, and classification of extinguisher indicated.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.
- B. Installation Instructions: Submit installation instructions for all portable fire extinguishers required. For fire extinguisher cabinets include roughing-in dimensions, and details showing mounting methods, relationship to surrounding construction, door hardware, cabinet type and materials, trim style and door construction, style and materials. Where color selections by Architect are required, include color charts showing full range of manufacturer’s standard colors and designs available.
- C. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function.
- D. Samples: Submit samples, 6” square, of each required finish. Prepare samples on metal of same gauge as metal to be used in the work. Where normal color variations are to be expected, include 2 or more units in each sample showing the limits of such variations.

1.6 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.8 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 MANUFACTURERS

- A. Subject to compliance with requirements, provide products of one of the following:
 - 1. JL Industries.
 - 2. Larsen's Mfg. Co.
 - 3. Potter Roemer.

2.3 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. General: Provide fire extinguishers for each extinguisher cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard which comply with requirements of governing authorities.
- B. Abbreviations indicated below to identify extinguisher type related to UL classification and rating system and not necessarily to type and amount of extinguishing material contained in extinguisher.
- C. Multi-Purpose Dry Chemical Type: UL rated 4-A:60-B:C, 10-lb nominal capacity, in enameled steel container, for Class A, Class B and Class C fires.

2.4 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or black baked-enamel finish.
 - 1. Source Limitations: Obtain mounting brackets and fire extinguishers from single source from single manufacturer.

2.5 CABINETS

- A. Type and Style: Fire extinguisher cabinets shall be metal, recessed, with plexiglass panel, sized to fit within the partition or wall depth. Provide fire rated cabinets within fire rated partitions.
- B. Color: Fire extinguisher cabinets shall be factory pre-finished with baked enamel in the colors selected by the Architect from the standard range of colors of the selected manufacturer.

2.6 IDENTIFICATION

- A. Identify fire extinguisher in cabinet with lettering spelling "FIRE EXTINGUISHER" painted on door by silk-screen process. Provide lettering on door as selected by Architect from manufacturer's standard letter sizes, styles, colors and layouts.
- B. Identify bracket-mounted extinguishers with red letter decals spelling "FIRE EXTINGUISHER" applied to wall surface. Letter size, style and location as selected by the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the areas and conditions where fire extinguishers and cabinets are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not

proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

- A. General: Install fire extinguisher cabinets, fire extinguishers, and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
 - 1. Top of fire extinguisher to be at 42 inches above finished floor.
 - 2. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
 - 3. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions.
- B. Where exact location of cabinets and bracket-mounted fire extinguishers is not indicated, locate as directed by the Architect.

3.3 SERVICE

- A. Determine the approximate completion date of the work and then inspect, charge, and tag the fire extinguishers at a date not more than 10 days before or not less than one day before actual completion date of the work.

END OF SECTION 104416

SECTION 10 60 00 – POLYCARBONATE ROOFING GLAZING SYSTEM

PART 1 – GENERAL

1.01 RELATED DOCUMENTS:

- A. General conditions of the contract, including all Supplementary Conditions.
- B. Manufacturer ISO 9001 certificates.
- C. Manufacturer ISO 14001 certificates.

1.02 WORK INCLUDED:

- A. Design and manufacturing of Standing Seam Multi Wall Polycarbonate system. An assembly of extruded polycarbonate multi wall panels joined together by a polycarbonate / aluminum joiner (connector), incorporated into a complete polycarbonate / aluminum profiles / accessories that has been tested and warranted by the manufacturer as a single source system.
- B. All Fasteners, aluminum profiles and end caps necessary to complete the specified structural assembly, water tightness and weatherability. Wall trims and side trims elements which are necessary to complete the water tightness are not part of the system but shall be included.
- C. The installation to be carried out by a skylight installer who has been in the skylight business for at least five (5) consecutive years. The manufacturer preserves its right to perform field inspection during and after installation. All warranty claims demand product to be reviewed as installed application.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

- A. Section - Structural Steel/Wood Framing/Concrete.
- B. Section - Sheet Metal and Flashing.
- C. Section - Sealant.

1.04 QUALITY ASSURANCE:

- A. Materials and products shall be manufactured by a company continuously and regularly employed in the manufacture of skylights using polycarbonate (not glass) panels for a period of at least ten (10) years.
- B. Erection shall be by a skylight installer who has been in the business of erecting similar material for at least five (5) consecutive years and can show evidence of satisfactory completion of projects of similar size, scope, and type.
- C. The manufacturer shall be responsible for the configuration and fabrication of the complete panel covering system, and will ensure that it fully meets all requirements of this

CONTRACT No. 22-523
DIVISION 10 – SPECIALTIES

specification. The manufacturer will not be responsible for the support structure of the covering system.

- D. Use of accessories supplied by a third party is not allowed unless it has written approval from the system manufacturer.

1.05 SUBMITTALS:

- A. Shop drawings showing the glazing system with installation in and connections to adjoining construction.
- B. Color samples for selection by the A/E.
- C. Manufacturer's written certification accompanied by substantiating data, stating that the products to be furnished are in accordance with or exceed these specifications.
- D. Certified test reports made by an independent organization for each type and class of panel system. Reports shall verify that the material will meet all performance requirements of this specification.
 - 1. Self-Ignition Temperature (ASTM 1929-3)
 - 2. Smoke Density (ASTM D-2843)
 - 3. Burning Extent (ASTM D-635)
 - 4. Loading test (ASTM E-330)
 - 5. Water Infiltration (ASTM E-331)
 - 6. Air Infiltration (ASTM E-283)
 - 7. Impact Loading (ASTM E-695)
- E. MAINTENANCE DATA:
The manufacturer shall provide recommended maintenance procedures, schedule of maintenance and materials required or recommended for maintenance.

1.06 WARRANTY:

- A. Provide a single source manufacturer warranty for glazing panels, framing system, and accessories.
- B. Provide manufacturer warranty which includes:
 - 1. Change of light transmission of no more than 6% for 10 years and no more than 1% per year thereafter.
 - 2. 5 years guarantee for water leak proof.
 - 3. Up to 10 years warranty (from the date of purchase) not to break or fail as a result of impact by hail measuring up to 20mm in diameter at speed of up to 21 m/s.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. The design and performance criteria of this job are based on products manufactured by PALRAM INDUSTRIES (1991) Ltd,
Phone +972 4 8459900, Fax +972 4 8444980;
Website: www.palram.com

2.02 PERFORMANCE:

- A. Appearance:
1. Panel thickness to be 4 mm.
 2. Panel width to be 600 mm.
- B. SUNGLAZE Panel joint system:
1. Panel shall be extruded in one single formable length. Transverse connections are not acceptable.
 2. The panels should be manufactured by extrusion with a grip-lock upstands that are integral to the unit. The upstands shall be 105 degrees to the panel face. Welding, gluing, cold bending, hot bending, vacuum or thermoforming of upstands is not acceptable.
 3. Use of the locking and fixing screws as shown in the manufacturer installation guide ensure designed load capability.
 4. After installation, the system shall be thermal expansion/contraction free (free floating movement).
- C. Flammability:
1. The panel shall be an approved light transmitting plastic with a CC1 fire rating classification per ASTM D-635. Smoke density no greater than 60 per ASTM D2843 and a minimum self-ignition temperature of 1162°F per ASTM 1929.
 2. The panel shall be self-extinguishing.
- D. Water Penetration:
1. There shall be no water penetration when tested per ASTM E 331 at a test pressure of 20 PSF.
- E. Air Infiltration:
1. Per ASTM D-283 at a test pressure of 6.24 PSF, maximum air infiltration shall be 0.05 CFM/sq. ft. of glazing area.
- F. Uniform Structural Loads
1. Per ASTM E-330, achieve a positive load of 140 psf with 60” oc horizontal spans.
 2. Per ASTM E-330, achieve a negative load of 45psf with 60” oc horizontal spans.
- G. Impact Loading

1. OSHA Life Safety STD 29 CFR - Impact force by blunt object of 500 lbf-ft per ASTM E- 695-03
2. Sunglaze shall have a falling weight impact resistance of 117 ft/lbs when tested in accordance to ISO 6603/1

H. Weatherability:

1. Panels shall consist of a polycarbonate resin with a permanent, co-extruded ultraviolet protective layer. Post-applied coating or films of dissimilar materials are unacceptable.

2.03 METAL FRAME STRUCTURE:

- A. System shall comply with building design loading criteria as indicated in the Structural drawings. Design criteria shall be:

Wind load 126 MPH

Snow load 21 PSF

- B. The framing of the glazing system shall be self-supporting between the support constructions. The deflection of the Structural framing members in a direction normal to the plane of the glazing, when subjected to a uniform load deflection, shall not exceed L/200 for the unsupported span.

2.03 METAL MATERIALS:

- A. Extruded Aluminum shall be ANSI/ASTM B221; 6063-T5.

B. Flashing:

1. 5005 H34 aluminum 0.04" minimum thickness.
2. Sheet metal flashings/closures/claddings are to be furnished shop formed to profile when lengths exceed 10 ft. in nominal 10-ft lengths. Field trimming of the flashing and field forming the ends is necessary to suit as-built conditions. Sheet metal ends are to overlap at least 6-in. to 8-in., set in a full bed of sealant and riveted if required.

- C. All Fasteners for aluminum framing to be stainless steel, cadmium plated steel or Zinc plated steel, excluding the final fasteners to the building.

- D. Finish for all exposed aluminum shall be selected by the A/E from the full range of the manufacturers standard and premium colors and anodized finishes.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. General Contractor to verify when structural support is ready to receive all work in this section and to convene a Pre-Installation Conference at least one week prior to commencing work of this Section. Attendance required of General Contractor, skylight installer and all parties directly affecting and effected by the work of this section.
- B. All submitted opening sizes, dimensions and tolerances are to be field verified by general contractor unless otherwise stipulated.
- C. Installer to examine area of installation to verify readiness of site conditions. Notify general contractor about any defects requiring correction. Do not work until conditions are satisfactory.

3.02 INSTALLATION

- A. Install components in strict accordance with manufacturer's instructions and approved shop drawings. Use proper fasteners and hardware for material attachments as specified.
- B. Use methods of attachment to structure allowing sufficient adjustment to accommodate tolerances.
- C. Remove all protective films from panels immediately after installation. Special protective film which can remain on the panels for few weeks can be ordered from the system manufacturer when required.

3.03 HANDLING AND STORAGE

- A. Sheets should be transported and stored horizontally, on a flat, sturdy pallet whose dimensions are equal or larger than the largest of the sheets, leaving no unsupported overhang. The sheets should be secured to the pallet during transportation and on-site handling. Comply with the stacking limitations indicated by the manufacturer.
- B. When moving a pallet with a forklift, always use forks as long as the sheets' width. Shorter forks used on a wider pallet may cause damage to the sheets.
- C. Protective wrapping should be removed as close to the actual time of installation (or use) as possible. Storage of the sheets should be in a covered, dry, ventilated place, away from direct sunlight and rain.
- D. Avoid extended exposure to direct sunlight, which may cause excessive heat buildup. Long term heating may lead to softening of the protective polyethylene masking, fusing it to the sheet's face and making removal difficult or even impossible.
- E. Avoid leaving the sheets stored unwrapped. Dirt may accumulate on the sheets and/or their edges, attracted by electrostatic charges in the sheets, necessitating extra time and labor for cleaning before installation.

- F. Whenever necessary to store the pallet in the open, cover it with white opaque polyethylene sheet, cardboard or any other insulating material, taking care to cover the stack completely.

3.04 CLEANING

- A. Follow manufacturer's instructions when washing down exposed panel surfaces using a solution of mild detergent in warm water that is applied with soft, clean wiping cloths.
- B. Follow strict panel manufacturer guidelines when removing foreign substances from panel surfaces requiring mineral spirits or any solvents that are acceptable for use.
- C. Installers shall leave panel system clean at completion of installation. Final cleaning is by others upon completion of project, following manufacturer's cleaning instructions.

END OF SECTION

SECTION 10 75 00 - FLAGPOLES

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 Commercial Grade flagpoles made from aluminum.
- B. Owner-Furnished Material: Flags.
- C. Related Requirements:
 - 1. Section 076200 "Sheet Metal Flashing and Trim" for counterflashing flashing at roof-mounted flagpoles.
 - 2. Section 264113 "Lightning Protection for Structures" for connecting roof-mounted metal flagpoles to lightning protection system.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.
- B. Shop Drawings: For flagpoles, including plans, elevations, details, and attachments to other work. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support. Include details of roof-mounted connections and mountings.
- C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- D. Delegated-Design Submittal: For flagpoles. Include loads, point reactions, and locations for attachment of flagpoles to building's structure.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

CONTRACT No. 22-523
DIVISION 10 - SPECIALTIES

1.5 COORDINATION

- A. Coordinate installation of anchorages for flagpoles. Furnish setting drawings, templates, and directions for installing anchorages that are to be embedded in building structure. Deliver such items to Project site in time for installation.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain flagpoles as complete units, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design flagpole assemblies.
- B. Seismic Performance: Flagpole assemblies shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- C. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand design loads indicated within limits and under conditions indicated.
 - 1. Wind Loads: Determine according to NAAMM FP 1001. Basic wind speed for Project location is 130mph.
 - 2. Base flagpole design on nylon or cotton flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.

2.3 ALUMINUM FLAGPOLES

- A. Aluminum Flagpoles: Cone-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B241/B241M, Alloy 6063, with a minimum wall thickness of 3/16 inch (4.8 mm).
- B. Exposed Height: 15 feet.
- C. Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:
 - 1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
 - 2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.

CONTRACT No. 22-523
DIVISION 10 - SPECIALTIES

- D. Cast-Metal Shoe Base: Made from aluminum with same finish and color as flagpoles for anchor-bolt mounting; furnish with anchor bolts.

- 1. Furnish connector to building's lightning protection system conductor.

2.4 FITTINGS

- A. Finial Ball: Flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.

- 1. 0.063-inch (1.6-mm) spun aluminum, finished to match flagpole.
 - 2. 20-oz. (0.70-mm) copper with 23-karat gold leaf finish.
 - 3. Spun stainless steel, finished to match flagpole.
 - 4. Spun copper alloy, finished to match flagpole.

- B. External Halyard: Ball-bearing, nonfouling, revolving truck assembly of cast metal with continuous 5/16-inch- (8-mm-) diameter, braided polypropylene halyard and 9-inch (228-mm) cast-metal cleats with fasteners. Finish exposed metal surfaces to match flagpole.

- 1. Halyards and Cleats: One at each flagpole.
 - 2. Halyard Flag Snaps: Stainless-steel swivel snap hooks with neoprene or vinyl covers. Furnish two per halyard.
 - 3. Plastic Halyard Flag Clips: Made from injection-molded, UV-stabilized, acetal resin (Delrin). Clips attach to flag and have two eyes for inserting both runs of halyards. Furnish two per halyard.

2.5 MISCELLANEOUS MATERIALS

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M.

2.6 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

- 1. Color and Gloss: As selected by Architect 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 and other conditions affecting performance of the Work.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

CONTRACT No. 22-523
DIVISION 10 - SPECIALTIES

3.2 FLAGPOLE INSTALLATION

- A. General: Install flagpoles where shown and according to [Shop Drawings and] manufacturer's written instructions.
- B. Baseplate: Install baseplate on washers placed over leveling nuts on bolts, and adjust until flagpole is plumb. After flagpole is plumb, tighten retaining nuts and fill space under baseplate solidly with nonshrink, nonmetallic grout. Finish exposed grout surfaces smooth and slope 45 degrees away from edges of baseplate.
- C. Mounting Brackets and Bases: Anchor brackets and bases securely to structural support with fasteners as indicated on Shop Drawings.

END OF SECTION 107526

SECTION 10 81 13 – BIRD CONTROL NETTING

PART I – GENERAL

1.1 SYSTEM DESCRIPTION

- A. Design Requirements: Select appropriate size net and fastening system as determined by site conditions and mounting surface.

1.2 SUMMARY

- A. Provide labor, materials and supervision to install bird control netting to the building structure. The bird netting shall stop sparrow, starlings and pigeons from roosting on the building structure.

1.3 QUALITY ASSURANCE

- A. Obtain all technical information on products and installation from the manufacturer.
- B. Installer must be completely familiar with the proper installation procedures for the netting and the specified mounting system.
- C. Installer shall visit the site to gather all information of existing site conditions, obtain and record accurate and complete dimensions that define the areas specified for enclosure by the netting.
- D. Single Source Responsibility: Netting and all parts / accessories of the bird netting shall be from one manufacturer.

1.4 SUBMITTALS

- A. Product Data: Submit all descriptive information from the manufacturer including catalogs, installation instructions and other descriptive material.
- B. Provide Warranty: Material and installation.
- C. Provide Samples: Each type of bird netting used, including proposed fastening methods and hardware.
- D. Provide statement by official indicating that they are a certified installation company.

1.5 PRODUCT HANDLING

- A. Protect products from damage before, during and after the installation.

1.6 PROJECT CONDITIONS

CONTRACT No. 22-523
DIVISION 10 - SPECIALTIES

- A. Coordination: Furnish all anchor devices required to fasten system to and around existing building structure. Coordinate installation with existing conditions and within on-site tolerances.
- B. Visit site and field measure prior to fabrication and delivery of materials.

1.7 WARRANTY

- A. Bird netting shall carry a minimum 10-year guarantee against U.V. breakdown for black netting, 3-year guarantee for white and stone netting.
- B. Installation shall be guaranteed for 2 years.
- C. Installation shall be performed by a Certified Authorized Installer.
 - 1. Proof of Certification required.

PART2 – PRODUCTS

2.1 PRODUCT DESCRIPTION

- A. Basis-of-Design Product: Subject to compliance with requirements, provide ¾” Heavy Duty 12/6 Bird Net 2000™ by Bird-B-Gone, or comparable product by one of the following:
 - 1. Nixalite of America, Inc.
 - 2. Bird Barrier America , Inc
- B. Bird Netting shall comply with the following:
 - 1. Material: U.V. stabilized knotted polyethylene net.
 - 2. Flame resistant (270°F melting point). Rot-proof, waterproof, non-conductive and stable in sub zero temperatures.
 - 3. Mesh Size: ¾”
 - 4. Color: Black
 - 5. Break Strength: ISO 1806 / 9001 protocol mesh tested in excess of 40 lbs. Proof of Test Certification Available.
 - 6. Sizes: As required.
 - 7. Hardware: All metal hardware or products are galvanized or stainless steel.

2.2 MOUNTING SYSTEMS

- A. Installer to contact manufacturer for up-to-date information and recommendations for bird netting hardware applications, item combinations as well as new items and procedures.
- B. Choose the hardware system that best suits the netting installation and conditions.

2.3 ACCESSORIES

- A. Bird Net Zippers: Install HD marine grade quality zippers as needed to allow access to any regularly maintained or access item such as mechanical equipment, lighting, fire protection, wifi routers, electrical access panels, filters, etc.
 - 1. After the netting is installed and tensioned, locate the best location for the zippers.
 - 2. Installed zipper directly on to bird netting with hog rings and hog ring tool.
 - 3. Run the zipper square to the netting mesh.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine the installation area and note any detrimental or hazardous work conditions. Notify contracting officer or inspector of the detrimental work conditions.
- B. Do not proceed with installation until conditions are corrected.

3.2 SURFACE PREPARATION

- A. Surface should be thoroughly cleaned and free of bird droppings, nesting materials, rust peeling paint or other debris.
- B. Remove or repair articles that may damage netting after installation, including overhanging foliage, brush and loose parts on the structure.

3.3 INSTALLATION

- A. Install bird netting as recommended by the manufacturer. Bird netting shall fit the area to be protected perfectly so pest birds cannot enter the protected area, and so the netting blends with the architecture.
- B. Bird netting shall be installed tightly and securely to ensure a long-lasting installation that is visually hard to see.

3.4 INSPECTION

- A. Visually inspect bird netting for any signs of poor installation, including loose screws, fasteners or un-removed debris.
- B. Immediately correct and repair as necessary.

END OF SECTION 10 81 13

CONTRACT No. 22-523
DIVISION 10 - SPECIALTIES

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SECTION 12 11 00 – MURAL ART

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes printing and installation of mural artwork at exterior building panels.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: Provide 8” x 10” samples of material on which the murals will be printed – 2 each to contractor, architect, artist.
- C. Proofs:
For each mural panel indicated, provide:
- 3 sets of 8”x10” 4 color on CHPL; to be used for color matching and resolution
 - 3 sets of full size paper proofs
- D. Qualification Data: for Printer/Installer. Provide list of 3 previous printing/installation projects performed in the previous 5 years that demonstrate relevant experience, including name of client and general project value.
- E. Warranty: Provide 10 year warranty against panel warping, breakage, or material deterioration, UV fading or delamination of the image, and staining, cracking or scratching of the surface.

1.3 QUALITY ASSURANCE

- A. Printer/Installer Qualifications: Printer/installer shall have:
1. The equipment to produce prints as per requirements
 2. The capacity to provide both printing and installation
 3. Experience in similar production for durability in exterior environments.
- B. Vendor: Subject to compliance with requirements, vendors whose work may be included includes but is not limited to:

Lori Squadere
AM&J Digital, a New York State Certified Women Owned Business Enterprise
800 North Pearl St Albany, NY 12204
AMJdigital.com; 518-434-2579

PART 2 - PRODUCTS

- 2.1 PANEL SUBSTRATE: 1/8 inch custom high res laminate –CHPL – also known as phenolic resin. Panels shall exceed the standards for decorative laminates established by the National Electrical Manufacturers Association NEMA LD3-1991 for resistance to wear, boiling water, high temperature, cigarette burns, fading, dimensional stability, staining, appearance and formability (bending and postforming grades).
- 2.2 PRINTING: 12-Color High Definition printing technology. Murals to be printed at 300 dpi and in a single piece for each panel. No piecing will be permitted. See drawings for mural size.
- 2.3 FINISHING: 10 year UV inhibitor.
- 2.4 CARE: Printed panels shall be cleanable by soap and water wash for ordinary maintenance. Use of commercial solvents for paint or graffiti removal shall be acceptable, without damage to the surface, deterioration of the image, or voiding of the warranty.

PART 3 - EXECUTION

- 3.1 PRINTING:
 - A. Image files will be provided by the architect.
 - B. Adjust printing following submission of proofs, as needed to achieve color, resolution, and image quality.
- 3.2 INSTALLATION
 - A. Fix murals in place on the building using adhesive and mechanical fasters. Install trim profile at entire perimeter as indicated in the drawings.
 - B. Remove any installations that are unacceptable to architect, GC, or Owner and reinstall all new material.
 - C. Provide final cleaning.

END OF SECTION 121100

SECTION 210517 - SLEEVES AND SLEEVE SEALS FOR FIRE SUPPRESSION PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Sleeves.
 2. Sleeve-seal systems.
 3. Sleeve-seal fittings.
 4. Grout.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
- C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

2.2 SLEEVE-SEAL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Advance Products & Systems, Inc.
 2. CALPICO, Inc.
 3. Metraflex Company (The).
 4. Pipeline Seal and Insulator, Inc.
 5. Proco Products, Inc.
- B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel or Stainless steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating or Stainless steel of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following
 1. Presealed Systems.
- B. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.4 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
 2. 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.
- 3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 - 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.
- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

3.4 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
 - 1. Exterior Concrete Walls above Grade:
 - a. Piping Smaller Than NPS 6: Sleeve-seal fittings.
 - 2. Concrete Slabs-on-Grade:
 - a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system.

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

- 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
3. Concrete Slabs above Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
4. Interior Partitions:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.

END OF SECTION 21 05 17

SECTION 210518 - ESCUTCHEONS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Escutcheons.
 2. Floor plates.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

- A. Split-Casting Brass Type: With polished, rough-brass finish and with concealed hinge and setscrew.

2.2 FLOOR PLATES

- A. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
1. Escutcheons for 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: split-plate, stamped-steel type with concealed hinge or split-plate, stamped-steel type with exposed-rivet hinge.

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

- c. Bare Piping at Ceiling Penetrations in Finished Spaces: split-plate, stamped-steel type with concealed hinge or split-plate, stamped-steel type with exposed-rivet hinge.
 - d. Bare Piping in Unfinished Service Spaces: split-plate, stamped-steel type with concealed hinge or split-plate, stamped-steel type with exposed-rivet hinge.
 - e. Bare Piping in Equipment Rooms: split-plate, stamped-steel type with concealed hinge or split-plate, stamped-steel type with exposed-rivet hinge.
- C. Install floor plates for piping penetrations of equipment-room floors.
- D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
- 1. New Piping: One-piece, floor-plate type.
- 3.2 FIELD QUALITY CONTROL
- A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 21 05 18

SECTION 210523 - GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION
PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Iron butterfly valves with indicators.
2. Check valves.
3. Iron OS&Y gate valves.
4. NRS gate valves.
5. Indicator posts.
6. Trim and drain valves.

1.2 DEFINITIONS

- A. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- B. NRS: Nonrising stem.
- C. OS&Y: Outside screw and yoke.
- D. SBR: Styrene-butadiene rubber.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of valve.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, and weld ends.
3. Set valves open to minimize exposure of functional surfaces.

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 operating handles or stems as lifting or rigging points.

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

- D. Protect flanges and specialties from moisture and dirt.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. UL Listed: Valves shall be listed in UL's "Online Certifications Directory" under the headings listed below and shall bear UL mark:
 - 1. Main Level: HAMV - Fire Main Equipment.
 - a. Level 1: HCBZ - Indicator Posts, Gate Valve.
 - b. Level 1: HLOT - Valves.
 - 1) Level 3: HLUG - Ball Valves, System Control.
 - 2) Level 3: HLXS - Butterfly Valves.
 - 3) Level 3: HMER - Check Valves.
 - 4) Level 3: HMRZ - Gate Valves.
 - 2. Main Level: VDGT - Sprinkler System & Water Spray System Devices.
 - a. Level 1: VQGU - Valves, Trim and Drain.
- B. FM Global Approved: Valves shall be listed in its "Approval Guide," under the headings listed below:
 - 1. Automated Sprinkler Systems:
 - a. Indicator posts.
 - b. Valves.
 - 1) Gate valves.
 - 2) Check valves.
 - a) Single check valves.
 - 3) Miscellaneous valves.
- C. Source Limitations for Valves: Obtain valves for each valve type from single manufacturer.
- D. ASME Compliance:
 - 1. ASME B16.1 for flanges on iron valves.
 - 2. ASME B1.20.1 for threads for threaded-end valves.
 - 3. ASME B31.9 for building services piping valves.
- E. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.
- F. NFPA Compliance: Comply with NFPA 24 for valves.

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

- G. Valve Pressure Ratings: Not less than the minimum pressure rating indicated or higher as required by system pressures.
- H. Valve Sizes: Same as upstream piping unless otherwise indicated.
- I. Valve Actuator Types:
 - 1. Worm-gear actuator with handwheel for quarter-turn valves, except for trim and drain valves.
 - 2. Handwheel: For other than quarter-turn trim and drain valves.
 - 3. Handlever: For quarter-turn trim and drain valves NPS 2 (DN 50) and smaller.

2.2 IRON BUTTERFLY VALVES WITH INDICATORS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Anvil International.
 - 2. Globe Fire Sprinkler Corporation.
 - 3. NIBCO INC.
 - 4. Victaulic Company.
- B. Description:
 - 1. Standard: UL 1091 and FM Global standard for indicating valves, (butterfly or ball type), Class Number 112.
 - 2. Minimum Pressure Rating: 175 psig (1200 kPa).
 - 3. Body Material: Cast or ductile iron.
 - 4. Seat Material: EPDM.
 - 5. Stem: Stainless steel.
 - 6. Disc: Ductile iron, nickel plated.
 - 7. Actuator: Worm gear or traveling nut.
 - 8. Supervisory Switch: Internal or external.
 - 9. Body Design: Grooved-end connections.

2.3 CHECK VALVES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Anvil International.
 - 2. Globe Fire Sprinkler Corporation.
 - 3. NIBCO INC.
 - 4. Victaulic Company.
 - 5. Viking Corporation.
- B. Description:
 - 1. Standard: UL 312 and FM Global standard for swing check valves, Class Number 1210.
 - 2. Minimum Pressure Rating: 175 psig (1200 kPa).

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

3. Type: Single swing check.
4. Body Material: Cast iron, ductile iron, or bronze.
5. Clapper: Bronze, ductile iron, or stainless steel.
6. Clapper Seat: Brass, bronze, or stainless steel.
7. Hinge Shaft: Bronze or stainless steel.
8. Hinge Spring: Stainless steel.
9. End Connections: Flanged, grooved, or threaded.

2.4 IRON OS&Y GATE VALVES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. NIBCO INC.
2. Victaulic Company.
3. Watts; a Watts Water Technologies company.

- B. Description:

1. Standard: UL 262 and FM Global standard for fire-service water control valves (OS&Y- and NRS-type gate valves).
2. Minimum Pressure Rating: 175 psig (1200 kPa).
3. Body and Bonnet Material: Cast or ductile iron.
4. Wedge: Cast or ductile iron, or bronze.
5. Wedge Seat: Cast or ductile iron, or bronze.
6. Stem: Brass or bronze.
7. Packing: Non-asbestos PTFE.
8. Supervisory Switch: External.
9. End Connections: Grooved.

2.5 NRS GATE VALVES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Mueller Co.
2. NIBCO INC.
3. Victaulic Company.

- B. Description:

1. Standard: UL 262 and FM Global standard for fire-service water control valves (OS&Y- and NRS-type gate valves).
2. Minimum Pressure Rating: 175 psig (1200 kPa).
3. Body and Bonnet Material: Cast or ductile iron.
4. Wedge: Cast or ductile iron.
5. Wedge Seat: Cast or ductile iron, or bronze.
6. Stem: Brass or bronze.
7. Packing: Non-asbestos PTFE.
8. Supervisory Switch: External.

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

9. End Connections: Grooved.

2.6 INDICATOR POSTS

A. Description:

1. Standard: UL 789 and FM Global standard for indicator posts.
2. Type: Underground
3. Base Barrel Material: Cast or ductile iron
4. Extension Barrel: Cast or ductile iron.
5. Cap: Cast or ductile iron.
6. Operation: Wrench or Handwheel.

2.7 TRIM AND DRAIN VALVES

A. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fire-End & Croker Corporation.
 - b. NIBCO INC.
 - c. Tyco Fire Products LP.
 - d. Victaulic Company.
 - e. Watts; a Watts Water Technologies company.
2. Description:
 - a. Pressure Rating: 175 psig (1200 kPa).
 - b. Body Design: Two piece.
 - c. Body Material: Forged brass or bronze.
 - d. Port size: Full or standard.
 - e. Seats: PTFE.
 - f. Stem: Bronze or stainless steel.
 - g. Ball: Chrome-plated brass.
 - h. Actuator: Handlever.
 - i. End Connections for Valves NPS 1 (DN 25) through NPS 2-1/2 (DN 65): Threaded ends.
 - j. End Connections for Valves NPS 1-1/4 and NPS 2-1/2 (DN 32 and DN 65): Grooved ends.

B. Angle Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Fire Protection Products, Inc.
 - b. NIBCO INC.
 - c. United Brass Works, Inc.

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

2. Description:
 - a. Pressure Rating: 175 psig (1200 kPa).
 - b. Body Material: Brass or bronze.
 - c. Ends: Threaded.
 - d. Stem: Bronze.
 - e. Disc: Bronze.
 - f. Packing: Asbestos free.
 - g. Handwheel: Malleable iron, bronze, or aluminum.

C. Globe Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO INC. or comparable product by one of the following:
 - a. NIBCO INC.
 - b. United Brass Works, Inc.
2. Description:
 - a. Pressure Rating: 175 psig (1200 kPa).
 - b. Body Material: Bronze with integral seat and screw-in bonnet.
 - c. Ends: Threaded.
 - d. Stem: Bronze.
 - e. Disc Holder and Nut: Bronze.
 - f. Disc Seat: Nitrile.
 - g. Packing: Asbestos free.
 - h. Handwheel: Malleable iron, bronze, or aluminum.

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 GENERAL REQUIREMENTS FOR VALVE INSTALLATION

- A. Comply with requirements in the following Sections for specific valve installation requirements and applications:
 - 1. Section 211200 "Fire-Suppression Standpipes" for application of valves in fire-suppression standpipes.
 - 2. Section 211313 "Wet-Pipe Sprinkler Systems" for application of valves in wet-pipe, fire-suppression sprinkler systems.
 - 3. Section 211316 "Dry-Pipe Sprinkler Systems" for application of valves in dry-pipe, fire-suppression sprinkler systems.
 - 4. Section 211316 "Dry-Pipe Sprinkler Systems" for application of valves in dry-pipe, fire-suppression sprinkler systems.
- B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.
- D. Install valves having threaded connections with unions at each piece of equipment arranged to allow easy access, service, maintenance, and equipment removal without system shutdown. Provide separate support where necessary.
- E. Install valves in horizontal piping with stem at or above the pipe center.
- F. Install valves in position to allow full stem movement.
- G. Install valve tags. Comply with requirements in Section 210553 "Identification for Fire-Suppression Piping and Equipment" for valve tags and schedules and signs on surfaces concealing valves; and the NFPA standard applying to the piping system in which valves are installed. Install permanent identification signs indicating the portion of system controlled by each valve.
- H. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire-department connections.
- I. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

END OF SECTION 210523

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SECTION 210529 - HANGERS AND SUPPORTS 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. Section Includes:

1. Metal pipe hangers and supports.
2. Fastener systems.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design trapeze pipe hangers and equipment supports.

- B. Structural Performance: Hangers and supports for fire-suppression piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7
 - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
 - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 - 3. Design seismic-restraint hangers and supports for piping and equipment
- C. NFPA Compliance: Comply with NFPA 13
- D. UL Compliance: Comply with UL 203.

2.2 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 - 1. Description: Factory-fabricated components, NFPA approved, UL listed, or FM approved for fire-suppression piping support.
 - 2. Galvanized Metallic Coatings: Pregalvanized or hot-dip galvanized.
 - 3. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel
- B. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- C. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

2.3 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: NFPA-approved, UL-listed, or FM-approved 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.
- B. Mechanical-Expansion Anchors: NFPA-approved, UL-listed, or FM-approved, insert-wedge-type anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
 - 1. Outdoor Applications: Stainless steel.

2.4 EQUIPMENT SUPPORTS

- A. Description: NFPA-approved, UL-listed, or FM-approved, welded, shop- or field-fabricated equipment support, made from structural-carbon-steel shapes.

2.5 MATERIALS

- A. Aluminum: ASTM B221.
- B. Carbon Steel: ASTM A1011/A1011M.

- C. Structural Steel: ASTM A36/A36M, carbon-steel plates, shapes, and bars; black and galvanized.
- D. Stainless Steel: ASTM A240/A240M.
- E. Grout: ASTM C1107/C1107M, 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, 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation, for penetrations through fire-rated walls, ceilings, and assemblies.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb

3.2 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with installation requirements of approvals and listings. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. 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. Install in accordance with approvals and listings.
 - 2. Install mechanical-expansion anchors in concrete, after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions. Install in accordance with approvals and listings.
- C. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- D. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- E. 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.

- F. Install lateral bracing with pipe hangers and supports to prevent swaying.
- G. 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.
- H. Load Distribution: Install hangers and supports, so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- I. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

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 bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

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. Touchup: Clean field welds and abraded, shop-painted areas. Paint exposed areas immediately after erecting hangers and supports. Use same materials as those 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 a minimum dry film thickness of 2.0 mils.
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded, shop-painted areas on miscellaneous metal are specified in Section 099113 "Exterior Painting." Section 099600 "High-Performance Coatings."
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A780/A780M.

3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

- B. Comply with NFPA requirements 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 finishes.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports and attachments for general service applications.
- F. Use stainless-steel pipe hangers and stainless-steel or corrosion-resistant attachments for hostile environment applications.
- G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.
- H. Use thermal hanger-shield inserts for insulated piping and tubing.
- I. Horizontal-Piping Hangers and Supports: Comply with NFPA requirements. 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. Steel Pipe Clamps (MSS Type 4): For suspension of NPS 1/2 to NPS 24 if little or no insulation is required.
 - 3. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 4. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
 - 5. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
 - 6. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
 - 7. 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 or carbon-steel plate.
 - 8. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 - 9. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
- J. 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 24.
 - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- K. Hanger-Rod Attachments: Comply with NFPA requirements.

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

- L. Building Attachments: Comply with NFPA requirements. 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. C-Clamps (MSS Type 23): For structural shapes.
 - 3. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

- M. Saddles and Shields: Comply with NFPA requirements. 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.

- N. Comply with NFPA requirements for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

- O. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

- P. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 210529

SECTION 210548 - VIBRATION AND SEISMIC CONTROLS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
1. Vibration isolators.
 2. Seismic-restrain devices.
 3. Restraining braces.

1.2 DEFINITIONS

- A. IBC: International Building Code.
- B. ICC-ES: ICC-Evaluation Service.

1.3 PERFORMANCE REQUIREMENTS

- A. Seismic-Restraint Loading: Retain a professional engineer licensed in the State of New York to provide seismic calculations.
- B. Wind Loading:
1. Basic Wind Speed: 98 MPH
 2. Exposure Category: C
 3. Importance Factor: 1.15 For all MEP Systems
- C. Seismic-Restraint Loading:
1. Seismic Importance Factor: 1.25 For all MEP Systems
 2. Occupancy Category: III
 3. Spectral Response Accel. (SS): 0.281g
 4. Spectral Response Accel. (S1): 0.073g
 5. Spectral Response Coeff. (SDS): 0.294g
 6. Spectral Response Coeff. (SD1): 0.117g
 7. Response Modification Factor (R): 3.0
 8. Seismic Design Category: B
 9. Site Class: D
 10. Seismic Response Coefficient (CS): 0.04
 11. Basic Seismic Force Resisting System:
 - a. Ancillary Building: Ordinary Precast Shear Walls
 - b. Boiler Plant Building: Steel and Concrete Composite Moment Frames
 12. Analysis Procedure: Equivalent Lateral Force
 13. Design Base Shear: 103K

1.4 ACTION 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 evaluation service member of ICC-ES or 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).

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer and testing agency.
- B. Welding certificates.

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.
 - 10. Or Engineer Approved Equal.
- 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.
- 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. 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:
 - 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.
- C. 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.
- 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. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.
- F. 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.
- G. 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.

- H. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.
- I. 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.
- J. 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.
- B. 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 or 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.

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

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 21 Section "Water-Based Fire-Suppression Systems" for piping flexible connections.

3.5 VIBRATION ISOLATION SCHEDULE

Sprinkler Equipment Vibration Isolation			
Equipment	Base Type	Isolator Type	Minimum Deflection (inch)
Compressor	Concrete Pad	Neoprene Pad	1/4
Sprinkler piping	N/A	Isolation Hanger	1/4

END OF SECTION 21 05 48

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SECTION 21 05 53 - IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Stencils.
5. Valve tags.
6. Warning tags.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- 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 and the proposed content for each label.
- D. Valve Schedules: Valve numbering scheme.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each piping system to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: stainless steel, 0.025 inch thick, with predrilled holes for attachment hardware.
2. Letter Color: Black.
3. Background Color: White.
4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

5. 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.
6. Fasteners: Stainless-steel rivets or self-tapping screws.
7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, with predrilled holes for attachment hardware.
- B. Letter Color: White.
- C. Background Color: Red.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- 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. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover 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.

- E. Pipe-Label Colors:
 - 1. Background Color: Red.
 - 2. Letter Color: White.

2.4 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, black unless otherwise indicated. Paint may be in pressurized spray-can form.
 - 3. Identification Paint: Exterior, in colors according to ASME A13.1 unless otherwise indicated.

2.5 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: stainless steel, 0.025 inch thick, with predrilled holes for attachment hardware.
 - 2. Fasteners: Brass wire-link chain or S-hook.
 - 3. Valve-Tag Color: Red.
 - 4. Letter Color: White.
- B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch 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.

2.6 WARNING TAGS

- A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
 - 1. Size: 3 by 5-1/4 inches minimum.
 - 2. Fasteners: Brass grommet and wire.
 - 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 LABEL INSTALLATION

- 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 or permanently fasten labels on each major item of mechanical equipment.
- D. Locate equipment labels where accessible and visible.
- E. Stenciled Pipe-Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, with painted, color-coded bands or rectangles on each piping system.
 - 1. Identification Paint: Use for contrasting background.
 - 2. Stencil Paint: Use for pipe marking.
- F. Pipe-Label Locations: 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. 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 25 feet along each run. Reduce intervals to 10 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

3.3 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems. List tagged valves in a valve-tag schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and with captions similar to those indicated in "Valve-Tag Size and Shape" Subparagraph below:

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

1. Valve-Tag Size and Shape:

- a. Fire-Suppression Standpipe: 1-1/2 inches round.
- b. Wet-Pipe Sprinkler System: 1-1/2 inches round.
- c. Clean-Agent Fire-Extinguishing System: 1-1/2 inches round.

3.4 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 21 05 53

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SECTION 211100 - FACILITY FIRE-SUPPRESSION WATER-SERVICE 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 fire-suppression water-service piping and related components outside the building **and service entrance piping through floor into the building** and the following:
 - 1. Pipes, fittings, and specialties.
 - 2. Fire-suppression specialty valves.
 - 3. Alarm devices.
- B. Utility-furnished products include water meters that are furnished to the site, ready for installation.
- C. Related Requirements:
 - 1. Section 211116 "Facility Fire Hydrants" for AWWA and UL-listed, dry- and wet-barrel fire hydrants.
 - 2. Section 211119 "Fire-Department Connections" for exposed-, flush-, and yard-type, fire-department connections.
 - 3. Section 211200 "Fire-Suppression Standpipes" for fire-suppression standpipes inside the building.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.
 - 2. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.

- B. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements:

1. Comply with requirements of utility company supplying the water. Include tapping of water mains and backflow prevention.
2. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

- 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. Comply with FM Global's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.

- E. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-suppression water-service piping.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:

1. Ensure that valves are dry and internally protected against rust and corrosion.
2. Protect valves against damage to threaded ends and flange faces.
3. Set valves in best position for handling. Set valves closed to prevent rattling.

- B. During Storage: Use precautions for valves, including fire hydrants, according to the following:

1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
2. Protect from weather. Store indoors and maintain temperature higher than ambient dew point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

- C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

- D. Deliver piping 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.

- E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

- F. Protect flanges, fittings, and specialties from moisture and dirt.

- G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.7 PROJECT CONDITIONS

- A. Interruption of Existing Fire-Suppression Water-Service Piping: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:
1. Notify [Architect] [Construction Manager] [Owner] no fewer than [two] <Insert number> days in advance of proposed interruption of service.
 2. Do not proceed with interruption of service without [Architect's] [Construction Manager's] [Owner's] written permission.

PART 2 - PRODUCTS

2.1 DUCTILE-IRON PIPE AND FITTINGS

- A. Grooved-Joint, Ductile-Iron Pipe: AWWA C151, with cut, rounded-grooved ends.
- B. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end.
- C. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end.
- D. Grooved-End, Ductile-Iron Pipe Appurtenances:
1. Grooved-End, Ductile-Iron Fittings: ASTM A47/A47M, malleable-iron castings or ASTM A536, ductile-iron castings with dimensions matching pipe.
 2. Grooved-End, Ductile-Iron-Piping Couplings: AWWA C606, for ductile-iron-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.
- E. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
1. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- F. Push-on-Joint, Ductile-Iron Fittings: AWWA C153, ductile-iron compact pattern.
1. Gaskets: AWWA C111, rubber.
- G. Flanges: ASME B16.1, Class 125, cast iron.

2.2 SPECIAL PIPE FITTINGS

- A. Ductile-Iron Flexible Expansion Joints:
1. Description: Compound, ductile-iron fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections. Assemble components for offset

and expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

2. Pressure Rating: 250 psig minimum.

B. Ductile-Iron Deflection Fittings:

1. Description: Compound, ductile-iron coupling fitting with sleeve and one or two flexing sections for up to 15-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
2. Pressure Rating: 250 psig minimum.

2.3 ENCASUREMENT FOR PIPING

- A. Standard: ASTM A674 or AWWA C105.
- B. Material: **high-density, cross-laminated PE film of 0.004-inch minimum thickness.**
- C. Form: **Sheet or tube.**
- D. Color: **Black or natural.**

2.4 JOINING MATERIALS

- A. Gaskets for Ferrous Piping and Copper-Alloy Tubing: ASME B16.21, asbestos free.
- B. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series.
- C. Bonding Adhesive for Fiberglass Piping: As recommended by fiberglass piping manufacturer.

2.5 PIPING SPECIALTIES

- A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
- B. Tubular-Sleeve Pipe Couplings:
 1. Description: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners, and with ends of same sizes as piping to be joined.
 2. Standard: AWWA C219.
 3. Center-Sleeve Material: [**Manufacturer's standard**] [**Carbon steel**] [**Stainless steel**] [**Ductile iron**] [**Malleable iron**].
 4. Gasket Material: Natural or synthetic rubber.
 5. Pressure Rating: [**150 psig**] [**200 psig**] <Insert value> minimum.
 6. Metal Component Finish: Corrosion-resistant coating or material.

2.6 CORPORATION VALVES

- A. Corporation Valves: Comply with AWWA C800. Include saddle and valve compatible with tapping machine **and manifold**
 - 1. Service Saddle: Copper alloy with seal and AWWA C800, threaded outlet for corporation valve.
 - 2. Corporation Valve: Bronze body and ground-key plug, with AWWA C800, threaded inlet and outlet matching service piping material.
 - 3. Manifold: Copper fitting with two to four inlets as required, with ends matching corporation valves and outlet matching service piping material.
- B. Meter Valves: Comply with AWWA C800 for high-pressure, service-line valves. Include angle-or straight-through-pattern bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.

2.7 CURB VALVES

- A. Curb Valves: Comply with AWWA C800 for high-pressure, service-line valves. Valve has bronze body, ground-key plug or ball, wide tee head, and inlet and outlet matching service piping material.
- B. Service Boxes for Curb Valves: Similar to AWWA M44 requirements for cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over curb valve and with a barrel approximately 3 inches in diameter.
 - 1. Shutoff Rods: Steel; with tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.
- C. Meter Valves: Comply with AWWA C800 for high-pressure, service-line valves. Include angle-or straight-through-pattern bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.

2.8 ALARM DEVICES

- A. General: UL 753 and FM Global's "Approval Guide" listing, of types and sizes to mate and match piping and equipment.
- B. Water-Flow Indicators: Vane-type water-flow detector, rated for 250-psig working pressure; designed for horizontal or vertical installation; with two single-pole, double-throw circuit switches to provide 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 when cover is removed.
- C. Supervisory Switches: Single pole, double throw; designed to signal valve in other than fully open position.
- D. Pressure Switches: Single pole, double throw; designed to signal increase in pressure.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Comply with excavating, trenching, and backfilling requirements in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

- A. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.
- B. Make connections larger than NPS 2 with tapping machine according to the following:
 - 1. Install tapping sleeve and tapping valve according to MSS SP-60.
 - 2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
 - 3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
 - 4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.
- C. Comply with NFPA 24 for fire-service-main piping materials and installation.
- D. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.
 - 1. Install encasement for piping according to ASTM A674 or AWWA C105.
- E. Bury piping with depth of cover over top at least **36 inches**, with top at least **12 inches** below level of maximum frost penetration, and according to the following:
 - 1. Under Driveways: With at least **36 inches** of cover over top.
 - 2. In Loose Gravelly Soil and Rock: With at least **12 inches** of additional cover.
- F. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.
- G. Extend fire-suppression water-service piping and connect to water-supply source and building fire-suppression water-service piping systems at locations and pipe sizes indicated.
 - 1. Terminate fire-suppression water-service piping within the building at the **floor slab** until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building's fire-suppression water-service piping systems when those systems are installed.
- H. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.
- I. Comply with requirements for fire-suppression water-service piping inside the building in the following Sections:

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

1. Section 211200 "Fire-Suppression Standpipes"
2. Section 211313 "Wet-Pipe Sprinkler Systems"
3. Section 211316 "Dry-Pipe Sprinkler Systems"

- J. Comply with requirements in Section 221116 "Domestic Water Piping" for potable-water piping inside the building.
- K. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."
- L. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

3.3 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure rating same as or higher than systems pressure rating for aboveground applications unless otherwise indicated.
- B. Install unions adjacent to each valve in tubing NPS 2 and smaller.
- C. Install flanges, flange adaptors, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- D. Ream ends of tubes and remove burrs.
- E. Remove scale, slag, dirt, and debris from outside and inside of pipes, tubes, and fittings before assembly.
- F. Copper-Tubing, Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.
- G. Copper-Tubing, Pressure-Sealed Joints: Use proprietary crimping tool and procedure recommended by copper, pressure-seal-fitting manufacturer.
- H. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.
- I. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts.
- J. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with bolts according to ASME B31.9.
- K. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.
- L. Do not use flanges or unions for underground piping.

3.4 ANCHORAGE INSTALLATION

- A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:
 - 1. Concrete thrust blocks.
 - 2. Locking mechanical joints.
 - 3. Set-screw mechanical retainer glands.
 - 4. Bolted flanged joints.
 - 5. Pipe clamps and tie rods.
- B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches in fire-suppression water-service piping according to NFPA 24 and the following:
 - 1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
- C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.5 VALVE INSTALLATION

- A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.
- B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.
- C. UL-Listed or FM Global-Approved Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.
- D. UL-Listed or FM Global-Approved Valves Other Than Gate Valves: Comply with NFPA 24.
- E. MSS Valves: Install as component of connected piping system.
- F. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.
- G. Support valves and piping, not direct buried, on concrete piers. Comply with requirements for concrete piers in Section 033000 "Cast-in-Place Concrete."

3.6 FIRE-DEPARTMENT CONNECTION INSTALLATION

- A. Install ball drip valves at each check valve for fire-department connection to mains.
- B. Install protective pipe bollards [**on two sides of**] [**on three sides of**] <Insert arrangement> each freestanding fire-department connection. Pipe bollards are specified in Section 055000 "Metal Fabrications."

3.7 ALARM DEVICE INSTALLATION

- A. General: Comply with NFPA 24 for devices and methods of valve supervision. Underground valves with valve box do not require supervision.
- B. Supervisory Switches: Supervise valves in open position.
 - 1. Valves: Grind away portion of exposed valve stem. Bolt switch, with plunger in stem depression, to OS&Y gate-valve yoke.
 - 2. Indicator Posts: Drill and thread hole in upper-barrel section at target plate. Install switch, with toggle against target plate, on barrel of indicator post.
- C. Locking and Sealing: Secure unsupervised valves as follows:
 - 1. Valves: Install chain and padlock on open OS&Y gate valve.
 - 2. Post Indicators: Install padlock on wrench on indicator post.
- D. Pressure Switches: Drill and thread hole in exposed barrel of fire hydrant. Install switch.
- E. Water-Flow Indicators: Install in water-service piping in vault. Select indicator with saddle and vane matching pipe size. Drill hole in pipe, insert vane, and bolt saddle to pipe.
- F. Connect alarm devices to building's fire-alarm system. Wiring and fire-alarm devices are specified in **Section 284621.11 "Addressable Fire-Alarm Systems**

3.8 CONNECTIONS

- A. Connect fire-suppression water-service piping to **existing water main**. Use **tapping sleeve and tapping valve**.
- B. Connect fire-suppression water-service piping to interior fire-suppression piping.

3.9 FIELD QUALITY CONTROL

- A. Use test procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described below.
- B. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- C. Hydrostatic Tests: Test at not less than one-and-one-half times the working pressure for two hours.
 - 1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to zero psig. Slowly increase again to test pressure and hold for one more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

- D. Prepare test and inspection reports.

3.10 IDENTIFICATION

- A. Install continuous underground **detectable** warning tape during backfilling of trench for underground fire-suppression water-service piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Section 312000 "Earth Moving."
- B. Permanently attach equipment nameplate or marker indicating plastic fire-suppression water-service piping or fire-suppression water-service piping with electrically insulated fittings, on main electrical meter panel. Comply with requirements for identifying devices in Section 220553 "Identification for Plumbing Piping and Equipment."

3.11 CLEANING

- A. Clean **and disinfect** fire-suppression water-service piping as follows:
 - 1. Purge new piping systems and parts of existing systems that have been altered, extended, or repaired before use.
 - 2. Use purging **and disinfecting** procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
 - 3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:
 - a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow it to stand for 24 hours.
 - b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow it to stand for three hours.
 - c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
 - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.
- B. Prepare reports of purging **and disinfecting** activities.

3.12 PIPING SCHEDULE

- 1.
- B. Underground fire-suppression water-service piping NPS 4 shall be **one of** the following:
 - 1. Grooved-end, ductile-iron pipe; grooved-end, ductile-iron pipe appurtenances; and grooved joints.
 - 2. Mechanical-joint, ductile-iron pipe; mechanical-joint, **ductile- or gray-iron, standard-pattern or [ductile-iron, compact-pattern]** fittings; glands, gaskets, and bolts; and gasketed joints.

3. Push-on-joint, ductile-iron pipe; push-on-joint, ductile-iron compact-pattern fittings; and gasketed joints.
- C. Underground fire-suppression water-service piping **NPS 6 to NPS 12** shall be **one of** the following:
1. Grooved-end, ductile-iron pipe; grooved-end, ductile-iron pipe appurtenances; and grooved joints.
 2. Mechanical-joint, ductile-iron pipe; mechanical-joint, **ductile- or gray-iron, standard-pattern or ductile-iron, compact-pattern**] fittings; glands, gaskets, and bolts; and gasketed joints.
 3. Push-on-joint, ductile-iron pipe; push-on-joint, ductile-iron compact-pattern fittings; and gasketed joints.
- D. **Aboveground** fire-suppression water-service piping **NPS 4** shall be **one of** the following:
1. Grooved-end, ductile-iron pipe; grooved-end, ductile-iron pipe appurtenances; and grooved joints.
- E. Underslab fire-suppression water-service piping **NPS 4** shall be **one of** the following:
1. Grooved-end, ductile-iron pipe; grooved-end, ductile-iron pipe appurtenances; and grooved joints.
 2. Mechanical-joint, ductile-iron pipe; mechanical-joint, **ductile- or gray-iron, standard-pattern or ductile-iron, compact-pattern** fittings; glands, gaskets, and bolts; and restrained, gasketed joints.
 3. Push-on-joint, ductile-iron pipe; push-on-joint, ductile-iron compact-pattern fittings; and restrained, gasketed joints.
- F. Underslab fire-suppression water-service piping **NPS 6 to NPS 12** shall be **one of** the following:
1. Grooved-end, ductile-iron pipe; grooved-end, ductile-iron pipe appurtenances; and grooved joints.
 2. Mechanical-joint, ductile-iron pipe; mechanical-joint, **ductile- or gray-iron, standard-pattern or ductile-iron, compact-pattern** fittings; glands, gaskets, and bolts; and restrained, gasketed joints.
 3. Push-on-joint, ductile-iron pipe; push-on-joint, ductile-iron compact-pattern fittings; and restrained, gasketed joints.

3.13 VALVE SCHEDULE

- A. Underground fire-suppression water-service shutoff valves NPS 3 and larger shall be **one of** the following:
1. 250-psig, AWWA, iron, nonrising-stem, resilient-seated gate valves.
 2. **250-psig** UL-listed or FM Global-approved, iron, nonrising-stem gate valves.
- B. Indicator-post underground fire-suppression water-service valves NPS 3 and larger shall be **250-psig**, UL-listed or FM Global-approved, iron, nonrising-stem gate valves with indicator-post flange.

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

- C. Standard-pressure, **aboveground** fire-suppression water-service shutoff valves NPS 3 and larger shall be **one of** the following:
 - 1. 250-psig, AWWA, iron, OS&Y, resilient-seated gate valves.
 - 2. **250-psig**, UL-listed or FM Global-approved, iron, OS&Y gate valves.
 - 3. **AWWA or UL-listed or FM Global-approved** butterfly valves.

- D. Fire-suppression water-service check valves NPS 3 and larger shall be **one of** the following:
 - 1. **AWWA or UL-listed or FM Global-approved** check valves.

END OF SECTION 211100

SECTION 211119 - FIRE-DEPARTMENT CONNECTIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Exposed-type fire-department connections.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each fire-department connection.

PART 2 - PRODUCTS

2.1 EXPOSED-TYPE FIRE-DEPARTMENT CONNECTION

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. American Fire Hose & Cabinet.
 2. Fire-End & Croker Corporation.
 3. Guardian Fire Equipment, Inc.
 4. Wilson & Cousins Inc.
- B. Standard: UL 405.
- C. Type: Exposed, projecting, for wall mounting.
- D. Pressure Rating: 175 psig (1200 kPa) minimum.
- E. Body Material: Corrosion-resistant metal.
- F. Inlets: Brass with threads according to NFPA 1963 and matching local fire-department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
- G. Caps: Brass, lugged type, with gasket and chain.
- H. Escutcheon Plate: Round, brass, wall type.
- I. Outlet: Back, with pipe threads.

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

- J. Number of Inlets: Two.
- K. Escutcheon Plate Marking: Similar to “AUTO SPKR & STANDPIPE.”
- L. Finish: Polished chrome plated.
- M. Outlet Size: NPS 6 (DN 150).

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 fire-department connections.
- B. Examine roughing-in for fire-suppression standpipe system to verify actual locations of piping connections before fire-department connection installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install wall-type fire-department connections.
- B. Install automatic (ball-drip) drain valve at each check valve for fire-department connection.

END OF SECTION 211119

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. Fire-department connections.
 - 4. Sprinklers.
 - 5. Alarm devices.
 - 6. Pressure gages.

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.

1.5 PERFORMANCE REQUIREMENTS

- A. Standard-Pressure Piping System Component: Listed for 175-psig (1200-kPa) minimum working pressure.
- B. Delegated Design: Design sprinkler system, including comprehensive engineering analysis by a qualified professional engineer in the State of New York, using performance requirements and design criteria indicated in the drawings.
- C. Sprinkler system design shall be approved by authorities having jurisdiction.
 - 1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.

2. Sprinkler Occupancy Hazard Classifications:
 - a. Building Service Areas: Ordinary Hazard, Group 1.
 - b. Electrical Equipment Rooms: Ordinary Hazard, Group 1.
 - c. General Storage Areas: Ordinary Hazard, Group 1.
 - d. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
 - e. Office and Public Areas: Light Hazard.
 3. Minimum Density for Automatic-Sprinkler Piping Design:
 - a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
 - b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
 4. Maximum Protection Area per Sprinkler: Per UL listing.
 5. Maximum Protection Area per Sprinkler:
 - a. Office Spaces: 225 sq. ft. .
 - b. Storage Areas: 130 sq. ft.
 - c. Mechanical Equipment Rooms: 130 sq. ft.
 - d. Electrical Equipment Rooms: 130 sq. ft.
 - e. Other Areas: According to NFPA 13 recommendations unless otherwise indicated.
 6. Total Combined Hose-Stream Demand Requirement: According to NFPA 13 unless otherwise indicated:
 - a. Light-Hazard Occupancies: 100 gpm for 30 minutes.
 - b. Ordinary-Hazard Occupancies: 250 gpm for 60 to 90 minutes.
- D. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated, include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For wet-pipe sprinkler systems. Include plans, elevations, sections, details, and attachments to other work.
 1. Wiring Diagrams: For power, signal, and control wiring.
- C. Delegated-Design Submittal: For sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

- A. 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.

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

2. HVAC hydronic piping.
3. Items penetrating finished ceiling include the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
4. HVAC duct work.

- B. Qualification Data: For qualified Installer and professional engineer.
- C. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.
- D. Welding certificates.
- E. Fire-hydrant flow test report.
- F. 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."
- G. Field quality-control reports.

1.8 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For sprinkler specialties to include in emergency, operation, and maintenance manuals.

1.9 QUALITY ASSURANCE

- A. Installer Qualifications:
 1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.
 - a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.
- B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- 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. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

1. NFPA 13, "Installation of Sprinkler Systems." As modified by the 2014 NYC Building Code Appendix Q.
2. NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances."

1.10 COORDINATION

- A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

1.11 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, Grade B. Pipe ends may be factory or field formed to match joining method.
- B. Schedule 30, black Steel Pipe: ASTM A 135; ASTM A 795/A 795M; or ASME B36.10M, wrought steel; with wall thickness not less than Schedule 30 and not more than Schedule 40. Pipe ends may be factory or field formed to match joining method.
- C. Black Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.
- D. Uncoated Steel Couplings: ASTM A 865, threaded.
- E. Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
- F. Malleable- or Ductile-Iron Unions: UL 860.
- G. Cast-Iron Flanges: ASME 16.1, Class 125.
- H. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

- I. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.
- J. Grooved-Joint, Steel-Pipe Appurtenances:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available 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. Tyco Fire & Building Products LP.
 - e. Victaulic Company.
 - 2. Pressure Rating: 175 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.
 - 5. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Victaulic Company.

2.3 LISTED FIRE-PROTECTION VALVES

- A. General Requirements:
 - 1. Valves shall be UL listed or FM approved.
 - 2. 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 available 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.
 - 3. Valves NPS 1-1/2 and Smaller: Bronze body with threaded ends.
 - 4. Valves NPS 2 and NPS 2-1/2: Bronze body with threaded ends or ductile-iron body with grooved ends.
 - 5. Valves NPS 3: Ductile-iron body with grooved ends.
- C. Iron Butterfly Valves:

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Anvil International, Inc.
 - b. Fivalco Inc.
 - c. Global Safety Products, Inc.
 - d. Kennedy Valve; a division of McWane, Inc.
 - e. Milwaukee Valve Company.
 - f. NIBCO INC.
 - g. Pratt, Henry Company.
 - h. Shurjoint Piping Products.
 - i. Tyco Fire & Building Products LP.
 - j. Victaulic Company.
2. Standard: UL 1091.
3. Pressure Rating: 175 psig.
4. Body Material: Cast or ductile iron.
5. Style: Lug or wafer.
6. End Connections: Grooved.

D. Check Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AFAC Inc.
 - b. American Cast Iron Pipe Company; Waterous Company Subsidiary.
 - c. Anvil International, Inc.
 - d. Clow Valve Company; a division of McWane, Inc.
 - e. Crane Co.; Crane Valve Group; Crane Valves.
 - f. Crane Co.; Crane Valve Group; Jenkins Valves.
 - g. Crane Co.; Crane Valve Group; Stockham Division.
 - h. Fire-End & Croker Corporation.
 - i. Fire Protection Products, Inc.
 - j. Fivalco Inc.
 - k. Globe Fire Sprinkler Corporation.
 - l. Groeniger & Company.
 - m. Kennedy Valve; a division of McWane, Inc.
 - n. Matco-Norca.
 - o. Metraflex, Inc.
 - p. Milwaukee Valve Company.
 - q. Mueller Co.; Water Products Division.
 - r. NIBCO INC.
 - s. Potter Roemer.
 - t. Reliable Automatic Sprinkler Co., Inc.
 - u. Shurjoint Piping Products.
 - v. Tyco Fire & Building Products LP.
 - w. United Brass Works, Inc.
 - x. Venus Fire Protection Ltd.

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

- y. Victaulic Company.
 - z. Viking Corporation.
 - aa. Watts Water Technologies, Inc.
-
- 2. Standard: UL 312.
 - 3. Pressure Rating: 250 psig minimum.
 - 4. Type: Swing check.
 - 5. Body Material: Cast iron.
 - 6. End Connections: Flanged or grooved.
- E. Iron OS&Y Gate Valves:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
 - b. American Valve, Inc.
 - c. Clow Valve Company; a division of McWane, Inc.
 - d. Crane Co.; Crane Valve Group; Crane Valves.
 - e. Crane Co.; Crane Valve Group; Jenkins Valves.
 - f. Crane Co.; Crane Valve Group; Stockham Division.
 - g. Hammond Valve.
 - h. Milwaukee Valve Company.
 - i. Mueller Co.; Water Products Division.
 - j. NIBCO INC.
 - k. Shurjoint Piping Products.
 - l. Tyco Fire & Building Products LP.
 - m. United Brass Works, Inc.
 - n. Watts Water Technologies, Inc.
 - 2. Standard: UL 262.
 - 3. Pressure Rating: 250 psig minimum.
 - 4. Body Material: Cast or ductile iron.
 - 5. End Connections: Flanged or grooved.
- F. Indicating-Type Butterfly Valves:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Anvil International, Inc.
 - b. Fivalco Inc.
 - c. Global Safety Products, Inc.
 - d. Kennedy Valve; a division of McWane, Inc.
 - e. Milwaukee Valve Company.
 - f. NIBCO INC.
 - g. Shurjoint Piping Products.
 - h. Tyco Fire & Building Products LP.
 - i. Victaulic Company.

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

2. Standard: UL 1091.
3. Pressure Rating: 175 psig minimum.
4. Valves NPS 2 and Smaller:
 - a. Valve Type: Ball or butterfly.
 - b. Body Material: Bronze.
 - c. End Connections: Threaded.
5. 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.
6. Valve Operation: Integral electrical, 115-V ac, prewired, single-circuit, supervisory switch visual indicating device.

G. NRS Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
 - b. American Valve, Inc.
 - c. Clow Valve Company; a division of McWane, Inc.
 - d. Crane Co.; Crane Valve Group; Stockham Division.
 - e. Kennedy Valve; a division of McWane, Inc.
 - f. Mueller Co.; Water Products Division.
 - g. NIBCO INC.
 - h. Tyco Fire & Building Products LP.
2. Standard: UL 262.
3. Pressure Rating: 250 psig minimum.
4. Body Material: Cast iron with indicator post flange.
5. Stem: Nonrising.
6. End Connections: Flanged or grooved.

2.4 TRIM AND DRAIN VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating: 175 psig minimum.

B. Angle Valves:

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available 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.

C. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Affiliated Distributors.
 - b. Anvil International, Inc.
 - c. Barnett.
 - d. Conbraco Industries, Inc.; Apollo Valves.
 - e. Fire-End & Croker Corporation.
 - f. Fire Protection Products, Inc.
 - g. Flowserve.
 - h. FNW.
 - i. Jomar International, Ltd.
 - j. Kennedy Valve; a division of McWane, Inc.
 - k. Kitz Corporation.
 - l. Legend Valve.
 - m. Metso Automation USA Inc.
 - n. Milwaukee Valve Company.
 - o. NIBCO INC.
 - p. Potter Roemer.
 - q. Red-White Valve Corporation.
 - r. Southern Manufacturing Group.
 - s. Stewart, M. A. and Sons Ltd.
 - t. Tyco Fire & Building Products LP.
 - u. Victaulic Company.
 - v. Watts Water Technologies, Inc.

D. Globe Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available 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.

2.5 SPECIALTY VALVES

A. General Requirements:

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating:
 - a. Standard-Pressure Piping Specialty Valves: 175 psig minimum.
3. Body Material: Cast or ductile iron.
4. Size: Same as connected piping.
5. End Connections: Flanged or grooved.

B. Automatic (Ball Drip) Drain Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AFAC Inc.
 - b. Reliable Automatic Sprinkler Co., Inc.
 - c. Tyco Fire & Building Products LP.
2. Standard: UL 1726.
3. Pressure Rating: 175 psig minimum.
4. Type: Automatic draining, ball check.
5. Size: NPS 3/4.
6. End Connections: Threaded.

2.6 FIRE-DEPARTMENT CONNECTIONS

A. Flush-Type, Fire-Department Connection:

1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AFAC Inc.
 - b. Elkhart Brass Mfg. Company, Inc.
 - c. GMR International Equipment Corporation.
 - d. Guardian Fire Equipment, Inc.
 - e. Potter Roemer.
2. Standard: UL 405.
3. Type: Flush, for wall mounting.
4. Pressure Rating: 175 psig minimum.
5. Body Material: Corrosion-resistant metal.
6. Inlets: Brass with threads according to NFPA 1963 and matching local fire-department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
7. Caps: Brass, lugged type, with gasket and chain.
8. Escutcheon Plate: Rectangular, brass, wall type.
9. Outlet: With pipe threads.

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

10. Number of Inlets: Two.
11. Escutcheon Plate Marking: Similar to "AUTO SPKR"
12. Finish: Polished chrome plated.
13. Outlet Size: NPS 4.

2.7 SPRINKLER SPECIALTY PIPE FITTINGS

A. Flow Detection and Test Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available 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.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

B. Sprinkler Inspector's Test Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AGF Manufacturing Inc.
 - b. Triple R Specialty.
 - c. Tyco Fire & Building Products LP.
 - d. Victaulic Company.
 - e. Viking Corporation.
2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Cast- or ductile-iron housing with sight glass.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

2.8 SPRINKLERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. AFAC Inc.
 2. Globe Fire Sprinkler Corporation.
 3. Reliable Automatic Sprinkler Co., Inc.
 4. Tyco Fire & Building Products LP.
 5. Venus Fire Protection Ltd.
 6. Victaulic Company.
 7. Viking Corporation.
- B. General Requirements:
1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
 2. Pressure Rating for Automatic Sprinklers: 175 psig (1200 kPa) minimum.
- C. Automatic Sprinklers with Heat-Responsive Element:
1. 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:
1. Chrome plated.
 2. Bronze.
 3. Painted.
- E. 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: Plastic, white finish, one piece, flat.
 2. Sidewall Mounting: Plastic, white finish, one piece, flat.

2.9 ALARM DEVICES

- A. Alarm-device types shall match piping and equipment connections.
- B. Electrically Operated Alarm Bell:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available 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. Notifier; a Honeywell company.

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

- c. Potter Electric Signal Company.
 2. Standard: UL 464.
 3. Type: Vibrating, metal alarm bell.
 4. Size: 6-inch minimum diameter.
 5. Finish: Red-enamel factory finish, suitable for outdoor use.
- C. Water-Flow Indicators:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ADT Security Services, Inc.
 - b. McDonnell & Miller; ITT Industries.
 - c. Potter Electric Signal Company.
 - d. System Sensor; a Honeywell company.
 - e. Viking Corporation.
 - f. Watts Industries (Canada) Inc.
 2. Standard: UL 346.
 3. Water-Flow Detector: Electrically supervised.
 4. 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.
 5. Type: Paddle operated.
 6. Pressure Rating: 250 psig.
 7. Design Installation: Horizontal or vertical.
- D. Pressure Switches:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AFAC Inc.
 - b. Barksdale, Inc.
 - c. Detroit Switch, Inc.
 - d. Potter Electric Signal Company.
 - e. System Sensor; a Honeywell company.
 - f. Tyco Fire & Building Products LP.
 - g. United Electric Controls Co.
 - h. Viking Corporation.
 2. Standard: UL 346.
 3. Type: Electrically supervised water-flow switch with retard feature.
 4. Components: Single-pole, double-throw switch with normally closed contacts.
 5. Design Operation: Rising pressure signals water flow.
- E. Valve Supervisory Switches:

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available 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.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that controlled valve is in other than fully open position.

2.10 PRESSURE GAGES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. AMETEK; U.S. Gauge Division.
 2. Ashcroft, Inc.
 3. Brecco Corporation.
 4. 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" or "AIR/WATER" label on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Perform fire-hydrant flow test according to NFPA 13, NFPA 291 and NYC DEP requirements. Use 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.

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

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, apparatus, and equipment 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 risers adjacent to standpipes when sprinkler piping is connected to standpipes.
- J. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.
- K. Install alarm devices in piping systems.
- L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.
- M. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. 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.
- N. Fill sprinkler system piping with water.
- O. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 21 Section "Sleeves and Sleeve Seals for Fire-Suppression Piping."
- P. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 21 Section "Sleeves and Sleeve Seals for Fire-Suppression Piping."

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

- Q. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 21 Section "Escutcheons for Fire-Suppression Piping."

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, 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. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.
- I. Steel-Piping, Pressure-Sealed Joints: Join lightwall steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.
- J. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
 - 1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.
- K. 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.

3.4 INSTALLATION OF COVER SYSTEM FOR SPRINKLER PIPING

- A. Install cover system, brackets, and cover components for sprinkler piping according to manufacturer's "Installation Manual" and with NFPA 13 for supports.

3.5 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, 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 except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.
- D. Specialty Valves:
 - 1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.
 - 2. Alarm Valves: Include bypass check valve and retarding chamber drain-line connection.

3.6 SPRINKLER INSTALLATION

- A. Install sprinklers in suspended ceilings in center of narrow dimension of acoustical ceiling panels.

3.7 FIRE-DEPARTMENT CONNECTION INSTALLATION

- A. Install wall-type, fire-department connections.
- B. Install automatic (ball drip) drain valve at each check valve for fire-department connection.

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.
- B. Tests and Inspections:

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

1. Leak Test: After installation, charge systems 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.
 3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
 4. Energize circuits to electrical equipment and devices.
 5. Coordinate with fire-alarm tests. Operate as required.
 6. Coordinate with fire-pump tests. Operate as required.
 7. Verify that equipment hose threads are same as local fire-department equipment.
- 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 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain specialty valve and pressure-maintenance pumps.

3.12 PIPING SCHEDULE

- A. Piping between Fire-Department Connections and Check Valves: Galvanized, standard-weight steel pipe with threaded ends; cast-iron threaded fittings; and threaded joints.
- B. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.
- C. Standard-pressure, wet-pipe sprinkler system, NPS 2 and smaller, shall be one of the following:
 1. Standard-weight or Schedule 30, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
 2. Standard-weight or Schedule 30, black-steel pipe with cut grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
- D. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 to NPS 6, shall be one of the following:
 1. Standard-weight or Schedule 30, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

2. Standard-weight or Schedule 30, black-steel pipe with cut grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

3.13 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.
3. Special Applications: as shown on the drawings.

B. Provide sprinkler types in subparagraphs below with finishes indicated.

1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
2. Upright Sprinklers: rough bronze in unfinished spaces not exposed to view.

END OF SECTION 21 13 13

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SECTION 211316 - DRY-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. Specialty valves.
3. Sprinkler specialty pipe fittings.
4. Sprinklers.
5. Alarm devices.
6. Manual control stations.
7. Pressure gages.

B. Related Requirements:

1. Section 211119 "Fire Department Connections" for exposed-, flush-, and yard-type fire department connections.
2. Section 210523 "Fire Protection Piping" for ball, butterfly, check, gate, post-indicator, and trim and drain valves.

1.3 DEFINITIONS

- A. Standard-Pressure Sprinkler Piping: Dry-pipe sprinkler system piping designed to operate at working pressure of 175-psig maximum.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For dry-pipe sprinkler systems.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, and control wiring.

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

- C. Delegated-Design Submittal: For dry-pipe sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. 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. Compressed air piping.
 - 2. Items penetrating finished ceiling including the following:
 - a. Hangers and supports
- B. Qualification Data: For qualified Installer and professional engineer.
- C. Design Data:
 - 1. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.
- D. Fire-hydrant flow test report.
- E. Field Test Reports:
 - 1. Fire-hydrant flow test report.
 - 2. 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."
- F. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For dry-pipe sprinkler systems and specialties to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- 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.

1.8 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.
 - a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

1.9 FIELD CONDITIONS

- A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:
1. Notify Architect, Construction Manager, Owner no fewer than two days in advance of proposed interruption of sprinkler service.
 2. Do not proceed with interruption of sprinkler service without written permission.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTIONS

- A. Dry-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing compressed air. Opening of sprinklers releases compressed air and permits water pressure to open dry-pipe valve. Water then flows into piping and discharges from opened sprinklers.

2.2 PERFORMANCE REQUIREMENTS

- A. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:
1. NFPA 13.
- B. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.
- C. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design dry-pipe sprinkler systems.
1. Perform or acquire fire-hydrant flow test records indicate the following conditions:
 - a. Date
 - b. Time
 - c. Performed by
 - d. Location of Residual Fire Hydrant R
 - e. Location of Flow Fire Hydrant F

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

- f. Static Pressure at Residual Fire Hydrant R
- g. Measured Flow at Flow Fire Hydrant F
- h. Residual Pressure at Residual Fire Hydrant R

D. Sprinkler system design shall be approved by authorities having jurisdiction.

- 1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
- 2. Sprinkler Occupancy Hazard Classifications:
 - a. Amusement Parks: Ordinary Hazard, Group 2
- 3. Minimum Density for Automatic-Sprinkler Piping Design:
 - a. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft. area. Increased as required for dry system and roof pitch
- 4. Maximum Protection Area per Sprinkler: According to UL listing.
- 5. Maximum Protection Area per Sprinkler:
 - a. combustible obstructed : 120 sq. ft.
 - b. Mechanical Equipment Rooms: 130 sq. ft.
 - c. Other Areas: According to NFPA 13 recommendations unless otherwise indicated.

E. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7

2.3 STEEL PIPE AND FITTINGS

- A. Standard-Weight, Internally galvanized-Steel Pipe: ASTM A53/A53M, Pipe ends may be factory or field formed to match joining method.
- B. Galvanized-Steel Pipe Nipples: ASTM A733, made of ASTM A53/A53M, standard-weight, seamless steel pipe with threaded ends.
- C. Galvanized-Steel Couplings: ASTM A865/A865M, threaded.
- D. Galvanized, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
- E. Malleable- or Ductile-Iron Unions: UL 860.
- F. Cast-Iron Flanges: ASME B16.1, Class 125.
 - 1.

2.4 SPECIALTY VALVES

- A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
- B. Pressure Rating:
 - 1. Standard-Pressure Piping Specialty Valves: 175-psig minimum.

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

- C. Body Material: Cast or ductile iron.
- D. Size: Same as connected piping.
- E. End Connections: Flanged or grooved.
- F. Dry-Pipe Valves:
 - 1. Standard: UL 260.
 - 2. Design: Differential-pressure type.
 - 3. Include UL 1486, quick-opening devices, trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
 - 4. Standard: UL 260.
 - 5. Type: Automatic device to maintain minimum air pressure in piping.
 - 6. Include shutoff valves to permit servicing without shutting down sprinkler piping, bypass valve for quick filling, pressure regulator or switch to maintain pressure, strainer, pressure ratings with 14- to 60-psig adjustable range, and 175-psig outlet pressure.
 - 7. Air Compressor:
 - a. General Air product or approved equal
 - b. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
 - c. Motor Horsepower: Fractional.
 - d. Power: 120-V ac, 60 Hz, single phase.
- G. Automatic (Ball Drip) Drain Valves:
 - 1. Tyco or approved equal
 - 2. Standard: UL 1726.
 - 3. Pressure Rating: 175-psig minimum.
 - 4. Type: Automatic draining, ball check.
 - 5. Size: NPS 3/4.
 - 6. End Connections: Threaded.

2.5 SPRINKLER PIPING SPECIALTIES

- A. General Requirements for Dry-Pipe System Fittings: UL listed for dry-pipe service.
- B. Branch Outlet Fittings:
 - 1. Standard: UL 213.
 - 2. Pressure Rating: 175-psig minimum
 - 3. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
 - 4. Type: Mechanical-tee and -cross fittings.
 - 5. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
 - 6. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
 - 7. Branch Outlets: Grooved, plain-end pipe, or threaded.
- C. Flow Detection and Test Assemblies:

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

1. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
2. Pressure Rating: 175-psig minimum
3. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
4. Size: Same as connected piping.
5. Inlet and Outlet: Threaded.

D. Sprinkler Inspector's Test Fittings:

1. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
2. Pressure Rating: 175-psig minimum
3. Body Material: Cast- or ductile-iron housing with sight glass.
4. Size: Same as connected piping.
5. Inlet and Outlet: Threaded.

2.6 SPRINKLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Reliable Automatic Sprinkler Co., Inc. (The).
2. Tyco Fire Products LP.
3. Victaulic Company.
4. Viking Corporation.

B. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

C. Pressure Rating for Automatic Sprinklers: 175-psig minimum.

D. Automatic Sprinklers with Heat-Responsive Element:

1. Nonresidential Applications: UL 199
2. 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.

E. Sprinkler Finishes: Chrome plated, bronze

F. Sprinkler Guards:

1. Standard: UL 199.
2. Type: Wire cage with fastening device for attaching to sprinkler.

2.7 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Water-Motor-Operated Alarm:

1. Standard: UL 753.
2. Type: Mechanically operated, with Pelton wheel.
3. Alarm Gong: Cast aluminum with red-enamel factory finish.

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

4. Size: 10-inch diameter.
5. Components: Shaft length, bearings, and sleeve to suit wall construction.
6. Inlet: NPS 3/4.
7. Outlet: NPS 1 drain connection.

C. Pressure Switches:

1. Standard: UL 346.
2. Type: Electrically supervised water-flow switch with retard feature.
3. Components: Single-pole, double-throw switch with normally closed contacts.
4. Design Operation: Rising pressure signals water flow.

D. Valve Supervisory Switches:

1. Standard: UL 346.
2. Type: Electrically supervised.
3. Components: Single-pole, double-throw switch with normally closed contacts.
4. Design: Signals that controlled valve is in other than fully open position.
5. 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

2.8 MANUAL CONTROL STATIONS

- A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide" for hydraulic operation, with union, NPS 1/2 pipe nipple, and bronze ball valve.
- B. Include metal enclosure labeled "MANUAL CONTROL STATION" with operating instructions and cover held closed by breakable strut to prevent accidental opening.

2.9 PRESSURE GAGES

- A. Standard: UL 393.
- B. Dial Size: 3-1/2- to 4-1/2-inch diameter.
- C. Pressure Gage Range: 0- to 250-psig minimum
- D. Label: Include "WATER" or "AIR/WATER" label on dial face.
- E. Air System Piping Gage: Include retard feature and "AIR" or "AIR/WATER" label on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.
- B. Report test results promptly and in writing.

3.2 SERVICE-ENTRANCE PIPING

- A. Connect sprinkler piping to water-service piping for service entrance to building. Comply with requirements in Section 211100 "Facility Fire-Suppression Water-Service Piping" for exterior piping.
- B. Install shutoff valve, pressure gage, drain, and other accessories indicated at connection to water-service piping.

3.3 WATER-SUPPLY CONNECTIONS

- A. Connect sprinkler piping to building's interior water-distribution piping. Comply with requirements for interior piping in Section 221116 "Domestic Water Piping."
- B. Install shutoff valve, check valve, pressure gage, and drain at connection to water supply.

3.4 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.
 - 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.
 - 2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.
- B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.
- C. Install seismic restraints on piping as required. Comply with NFPA 13 requirements for seismic-restraint device materials and installation.
- 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, apparatus, and equipment 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 risers adjacent to standpipes when sprinkler piping is connected to standpipes.
- J. Install automatic (ball drip) drain valves to drain piping between fire department connections and check valves. Drain to floor drain or to outside building.

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

- K. Connect compressed-air supply to dry-pipe sprinkler piping.
- L. Connect air compressor to the following piping and wiring:
 - 1. Pressure gages and controls.
 - 2. Electrical power system.
 - 3. Fire-alarm devices, including low-pressure alarm.
- M. Install alarm devices in piping systems.
- N. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements in NFPA 13. In seismic-rated areas, refer to Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."
- O. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. 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 are not subject to freezing.
- P. Drain dry-pipe sprinkler piping.
- Q. Pressurize and check dry-pipe sprinkler system piping and air-pressure maintenance devices
- R. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."
- S. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."
- T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210518 "Escutcheons for Fire-Suppression Piping."

3.5 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. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.
- I. 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.
- J. Joints using adapters compatible with materials of both piping systems.

3.6 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, 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 except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.
- D. Specialty Valves:
 - 1. Install valves in vertical position for proper direction of flow, in main supply to system.
 - 2. Install dry-pipe valves with trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
 - a. Install air compressor and compressed-air-supply piping.
 - b. Install air-pressure maintenance device with shutoff valves to permit servicing without shutting down sprinkler system; bypass valve for quick system filling; pressure regulator or switch to maintain system pressure; strainer; pressure ratings with 14- to 60-psig adjustable range; and 175-psig maximum inlet pressure.
 - c. Install compressed-air-supply piping from building's compressed-air piping system.

3.7 SPRINKLER INSTALLATION

- A. Install sprinklers with water supply from heated space. Do not install pendent or sidewall sprinklers in areas subject to freezing.

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 Section 260553 "Identification for Electrical Systems."

3.9 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Leak Test: After installation, charge systems 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.
 - 3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
 - 4. Energize circuits to electrical equipment and devices.
 - 5. Start and run air compressors.
 - 6. Coordinate with fire-alarm tests. Operate as required.
 - 7. Coordinate with fire-pump tests. Operate as required.
 - 8. Verify that equipment hose threads are same as local fire department equipment.
- B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.10 CLEANING

- A. Clean dirt and debris from sprinklers.
- B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.11 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain specialty valves.

CONTRACT No. 22-523
DIVISION 21 – FIRE SUPPRESSION

3.12 PIPING SCHEDULE

- A. Piping between Fire Department Connections and Check Valves: Galvanized, standard-weight steel pipe
- B. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.
- C. Standard-pressure, dry-pipe sprinkler system shall be:
 - 1. Standard-weight galvanized-steel pipe.

3.13 SPRINKLER SCHEDULE

- A. Use sprinkler types in subparagraphs below for the following applications:
 - 1. Spaces Subject to Freezing: Upright sprinklers
- B. Provide sprinkler types in subparagraphs below with finishes indicated.
 - 1. Upright Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.

END OF SECTION 211316

SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING 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. Sleeves.
 - 2. Sleeve-seal systems.
 - 3. Grout.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

2.2 SLEEVE-SEAL SYSTEMS

- 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. Advance Products & Systems, Inc.
 - 2. CALPICO, Inc.
 - 3. GPT; an EnPro Industries company (LINK-SEAL).
 - 4. Metraflex Company (The).
 - 5. Proco Products, Inc.
- B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
 - 1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Carbon steel.

3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating of length required to secure pressure plates to sealing elements.

2.3 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
 2. 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.
 3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
 1. Cut sleeves to length for mounting flush with both surfaces.
 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."

- E. 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 firestopping specified in 078400 "Firestopping."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
 - 1. Exterior Concrete Walls above Grade:
 - a. Galvanized-steel-pipe sleeves with sleeve-seal system.
 - 2. Exterior Concrete Walls above & below Grade:
 - a. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - 3. Concrete Slabs above Grade:
 - a. Galvanized-steel-pipe sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - 4. Interior Partitions:
 - a. Galvanized-steel-pipe sleeves.

END OF SECTION 220517

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SECTION 220518 - ESCUTCHEONS FOR PLUMBING 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. Escutcheons.
 - 2. Floor plates.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

2.2 FLOOR PLATES

- A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

1. Escutcheons for 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. Install floor plates for piping penetrations of equipment-room floors.

- D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
 1. New Piping: One-piece, floor-plate type.

END OF SECTION 220518

SECTION 220523.12 - BALL VALVES FOR PLUMBING 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.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
 - 1. Certification that products comply with NSF 61 and NSF 372.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, and soldered ends.
 - 3. Set ball valves open to minimize exposure of functional surfaces.
- 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 operating handles or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B1.20.1 for threads for threaded end valves.
 - 2. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 3. ASME B16.18 for solder-joint connections.
 - 4. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 and NSF 372 for valve materials for potable-water service.
- D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Actuator Types:
 - 1. Gear Actuator: For quarter-turn valves NPS 4 and larger.
 - 2. Handlever: For quarter-turn valves smaller than NPS 4.
- H. Valves in Insulated Piping:
 - 1. Include 2-inch stem extensions.
 - 2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
 - 3. Memory stops that are fully adjustable after insulation is applied.

2.2 BRONZE BALL VALVES

- A. Bronze Ball Valves, Three-Piece with Full Port and Bronze or Brass Trim:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Apollo Flow Controls; Conbraco Industries, Inc.
 - b. Milwaukee Valve Company.
 - c. NIBCO INC.
 - d. WATTS.
 - 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.
- g. Stem: Bronze or brass.
- h. Ball: Chrome-plated brass.
- i. Port: Full.

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 valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- B. Select valves with the following end connections:
 - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option or press-end option is indicated in valve schedules below.

3.4 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller:
 - 1. Bronze ball valves, three-piece with full port and bronze or brass trim. Provide with threaded-joint ends.

END OF SECTION 22 05 23.12

SECTION 220523.15 - GATE VALVES FOR PLUMBING 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. Iron gate valves.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. NRS: Nonrising stem.
- C. OS&Y: Outside screw and yoke.
- D. RS: Rising stem.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
 - 1. Certification that products comply with NSF 61 and NSF 372.

1.5 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 gate valves closed to prevent rattling.
- 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. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B16.1 for flanges on iron valves.
 - 2. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 3. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 and NSP 372 for valve materials for potable-water service.
- D. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- E. Valve Sizes: Same as upstream piping unless otherwise indicated.
- F. RS Valves in Insulated Piping: With 2-inch stem extensions.
- G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 IRON GATE VALVES

- A. Iron Gate Valves, OS&Y, Class 125:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane; a Crane brand.
 - b. Hammond Valve.
 - c. Milwaukee Valve Company.
 - d. NIBCO INC.
 - 2. Description:
 - a. Standard: MSS SP-70, Type I.
 - b. CWP Rating: 200 psig.
 - c. Body Material: Gray iron with bolted bonnet.
 - d. Ends: Flanged.
 - e. Trim: Bronze.
 - f. Disc: Solid wedge.
 - g. Packing and Gasket: Asbestos free.

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 valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

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. Use gate valves for shutoff service only.
- B. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

3.5 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2-1/2 and Larger: Iron gate valves, OS&Y, Class 125 with flanged ends.

END OF SECTION 22 05 23.15

SECTION 220529 - 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. Section Includes:
 - 1. Pipe Hangers and Supports.
 - 2. Inserts.
 - 3. Fastener Systems.
- B. Related Sections:

1.3 DEFINITIONS

Retain definitions remaining after this Section has been edited.

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
 - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 - 3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:
 - 1. Pipe Hangers and Supports
 - 2. Inserts
 - 3. Fastener Systems
 - 4. Equipment Supports

- C. Delegated-Design Submittal: For trapeze hangers 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. Detail fabrication and assembly of trapeze hangers.
 - 2. Design Calculations: Calculate requirements for designing trapeze hangers.

1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.7 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Packing, shipping, handling, and unloading:
 - 1. Deliver, store, and handle materials in accordance with manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. CARBON-STEEL PIPE HANGERS AND SUPPORTS:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
 - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

- B. TRAPEZE PIPE HANGERS

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

1. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

C. METAL FRAMING SYSTEMS

1. MFMA Manufacturer Metal Framing Systems:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.
 - c. Flex-Strut Inc.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut Corporation; Tyco International, Ltd.
 - g. Wesanco, Inc.
3. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
4. Standard: MFMA-4.
5. Channels: Continuous slotted steel channel with inturned lips.
6. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
7. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.
8. Metallic Coating: Hot-dipped galvanized.

2.2 INSERTS

A. THERMAL-HANGER SHIELD INSERTS

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carpenter & Paterson, Inc.
 - b. Clement Support Services.
 - c. ERICO International Corporation.
 - d. National Pipe Hanger Corporation.
 - e. PHS Industries, Inc.
 - f. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
 - g. Piping Technology & Products, Inc.
 - h. Rilco Manufacturing Co., Inc.
 - i. Value Engineered Products, Inc.
2. Insulation-Insert Material for Cold Piping: ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.
3. Insulation-Insert Material for Hot Piping: ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.
4. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
5. For Clevis Hangers: Insert and shield shall cover lower 180 degrees of pipe.
6. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.3 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.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless-steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.4 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-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, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal 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 the building structure.
- B. Metal 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 for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
- D. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- E. 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.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- F. Install lateral bracing with pipe hangers and supports to prevent swaying.
- G. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- H. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- I. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- J. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.
- K. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- L. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- M. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- N. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers, and metal framing systems and attachments for general service applications.
- O. Use stainless-steel pipe hangers, and fiberglass pipe hangers and fiberglass strut systems and stainless-steel attachments for hostile environment applications.
- P. Use copper-plated pipe hangers and stainless-steel attachments for copper piping and tubing.
- Q. 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.
- R. 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-joist 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.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

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.
- S. 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.
- T. 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 allow 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 allow 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 allow 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.

U. Domestic Cold & Hot Water ½ to 4 inches

1. Hangers:
 - a. Adjustable, Steel Clevis Hangers (MSS Type 1).
2. Floor Support: Floor Support:
 - a. Steel-pipe base stanchion support and cast-iron floor flange, and with U-bolt to retain pipe (MSS Type 37).
3. Wall Support (Indoor):
 - a. Welded-Steel Brackets (MSS Type 31 – 750 lb, MSS Type 32 – 1,500 lb, and MSS Type 33 – 3000 lb).
4. Vertical-Piping Clamps (Indoor):
 - a. Up to 4 inches: Carbon Steel Riser Clamps (MSS Type 42).
5. Multiple Pipe:
 - a. Up to 4 inches: Trapeze Pipe Hanger (MSS SP-69).
6. Hanger Spacing & Rod Diameter
 - a. ½ to 1 ½ inches: 6 feet hanger spacing, 3/8"Ø rod
 - b. 2 inches: 8 feet hanger spacing, ½"Ø rod
 - c. 2 ½ to 3 inches: 10 feet hanger spacing, 5/8"Ø rod
 - d. 3 to 4 inches: 10 feet hanger spacing, ¾"Ø rod

3.2 INSERT INSTALLATION – THERMAL-HANGER SHIELD:

1. Install in pipe hanger and shield for insulated piping.
2. Insulated Piping:
 - a. Attach clamps and spacers to piping.
 - 1) Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - 2) Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
3. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
4. 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.
5. 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.
6. 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.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- 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.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 FASTENER INSTALLATION

- 1. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.
- 2. 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.
- 3. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- 4. 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.

3.4 METAL FABRICATIONS

- A. Comply with MFMA-103 for metal framing system
- B. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hanger.
- C. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- D. Field Welding: Comply with AWS D1.1/D1.1M 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 so contours of welded surfaces match adjacent contours.

3.5 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 a minimum dry film thickness of 2.0 mils.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal shall follow facility standards.

Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 220529

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SECTION 220553 - 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. Warning signs and labels.
 - 3. Pipe labels.
 - 4. Stencils.
 - 5. Valve tags.
 - 6. Warning tags.

1.3 ACTION 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. Metal Labels for Equipment:
 - 1. Material and Thickness: Aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 - 3. 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.
 - 4. Fasteners: Stainless-steel rivets or self-tapping screws.
 - 5. 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 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: Black.
- C. Background Color: Yellow.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- 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.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- 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. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover 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.

2.4 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, alkyd enamel > black unless otherwise indicated. Paint may be in pressurized spray-can form.
 3. Identification Paint: Exterior, alkyd enamel in colors according to ASME A13.1 unless otherwise indicated.

2.5 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: Aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 2. Fasteners: Brass wire-link or beaded chain; or S-hook.
- B. Valve Schedules: For each piping system, on 18-by-24-inch 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.

2.6 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 major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Piping Color-Coding: Painting of piping shall follow facility standards.
- B. 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.
- C. 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.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

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.

D. Pipe Label Color Schedule:

1. Domestic Water Piping:
 - a. Background Color: Green.
 - b. Letter Color: White.
2. Sanitary, Vent, and Storm Drainage Piping:
 - a. Background Color: Green.
 - 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 lawn-watering hose connections; 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: 1-1/2 inches, round.
 - b. Hot Water: 1-1/2 inches, round.
 2. Valve-Tag Color:
 - a. Cold Water: Natural.
 - b. Hot Water: Natural.
 3. Letter Color:
 - a. Cold Water: Black.
 - b. Hot Water: Black.

3.5 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 220553

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SECTION 220719 - PLUMBING PIPING 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 insulating the following plumbing piping services:
 - 1. Domestic cold-water piping.
 - 2. Domestic hot-water piping.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 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.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. 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.
- C. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing 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 agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
- C. Comply with the following applicable standards and other requirements specified for miscellaneous components:
 - 1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 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.

1.7 COORDINATION

- A. Coordinate sizes and locations 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. 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.
- C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. 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 "Piping Insulation Schedule 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. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Fibrex Insulations Inc.; Coreplus 1200.
 - b. Johns Manville; Micro-Lok.
 - c. Knauf Insulation; 1000-Degree Pipe Insulation.
 - d. Manson Insulation Inc.; Alley-K.
 - e. Owens Corning; Fiberglas Pipe Insulation.
 - 2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
 - b. Eagle Bridges - Marathon Industries; 225.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
 - d. Mon-Eco Industries, Inc.; 22-25.
 - 2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. ASJ Adhesive, and FSK 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:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
 - b. Eagle Bridges - Marathon Industries; 225.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-20.
 - d. Mon-Eco Industries, Inc.; 22-25.
 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
 - b. Vimasco Corporation; 749.
 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 5. Color: White.
- C. 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:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-30.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- b. Eagle Bridges - Marathon Industries; 501.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-35.
 - d. 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.
- D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Encacel.
 - b. Eagle Bridges - Marathon Industries; 570.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 60-95/60-96.
 2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
 3. Service Temperature Range: Minus 50 to plus 220 deg F.
 4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
 5. Color: White.
- E. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
 - b. Eagle Bridges - Marathon Industries; 550.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
 - d. Mon-Eco Industries, Inc.; 55-50.
 - e. Vimasco Corporation; WC-1/WC-5.
 2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 4. Solids Content: 60 percent by volume and 66 percent by weight.
 5. Color: White.

2.4 SEALANTS

- A. FSK and Metal Jacket Flashing Sealants:
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- b. Eagle Bridges - Marathon Industries; 405.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
 - d. Mon-Eco Industries, Inc.; 44-05.
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: Aluminum.
 6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 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, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.5 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. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.6 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- B. Underground Direct-Buried Jacket: 125-mil-thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Pittsburgh Corning Corporation; Pittwrap.
 - b. Polyguard Products, Inc.; Insulrap No Torch 125.

2.7 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:
 - a. ABI, Ideal Tape Division; 428 AWF ASJ.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
 - c. Compac Corporation; 104 and 105.
 - 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:
 - a. ABI, Ideal Tape Division; 491 AWF FSK.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
 - c. Compac Corporation; 110 and 111.
 - d. Venture Tape; 1525 CW NT, 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.

- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide one of the following:

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- a. ABI, Ideal Tape Division; 370 White PVC tape.
 - b. Compac Corporation; 130.
 - c. Venture Tape; 1506 CW NS.
2. Width: 2 inches.
 3. Thickness: 6 mils.
 4. Adhesion: 64 ounces force/inch in width.
 5. Elongation: 500 percent.
 6. Tensile Strength: 18 lbf/inch in width.
- D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ABI, Ideal Tape Division; 488 AWF.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
 - c. Compac Corporation; 120.
 - d. Venture Tape; 3520 CW.
 - e. .
 2. Width: 2 inches.
 3. Thickness: 3.7 mils.
 4. Adhesion: 100 ounces force/inch in width.
 5. Elongation: 5 percent.
 6. Tensile Strength: 34 lbf/inch in width.

2.8 SECUREMENTS

- A. Bands:
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ITW Insulation Systems; Gerrard Strapping and Seals.
 - b. RPR Products, Inc.; Insul-Mate Strapping and Seals.
 - c. .
 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 seal or closed seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.
- C. Wire: 0.062-inch soft-annealed, stainless steel.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. C & F Wire.

2.9 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Piping Enclosures:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Truebro; a brand of IPS Corporation.
 - b. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.
2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
1. Verify that systems to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
- B. 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.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
 2. 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.

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 piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- 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 2 o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, 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. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.
 - 4. Cleanouts.

3.4 PENETRATIONS

- A. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 - 4. Seal jacket to wall flashing 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" for 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.

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 strainers 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. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
 6. 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.
 7. 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.
 8. 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.
 9. 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, pressure temperature taps, test connections, flow meters, sensors, switches, 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.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF MINERAL-FIBER INSULATION

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. Instead, 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.

3.7 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

3.8 FINISHES

A. 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. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint aluminum or stainless-steel jackets.

3.9 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 pipe, fittings, strainers, and valves, 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 three locations of straight pipe, three locations of threaded fittings, , two locations of threaded strainers, , three locations of threaded valves, and three locations 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.

3.10 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range.
- B. PIPING INSULATION SCHEDULE

CW: Domestic Cold Water

HW: Domestic Hot Water

INDOOR PIPE INSULATION SCHEDULE					
System	Visibility	Insulation Material	Jacket	Pipe Size (inch)	Insulation Thickness (inch)
CW	Conceal	Pre-formed Glass Fiber Type I	None	1/2 to < 1-1/2 1-1/2 to < 4	1/2 1
	Expose	Pre-formed Glass Fiber Type I	Factory Applied Jacket	1/2 to < 1-1/2 1-1/2 to < 4	1/2 1
HW	Conceal	Pre-formed Glass Fiber Type I	None	1/2 to < 1-1/2 1-1/2 to < 4	1 1 ½
	Expose	Pre-formed Glass Fiber Type I	Factory Applied Jacket	1/2 to < 1-1/2 1-1/2 to < 4	1 1 ½

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

END OF SECTION 220719

SECTION 221113 - FACILITY WATER DISTRIBUTION 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 water-distribution piping and related components outside the building for water service.
- B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

1.3 DEFINITIONS

- A. EPDM: Ethylene propylene diene terpolymer rubber.
- B. LLDPE: Linear, low-density polyethylene plastic.
- C. PA: Polyamide (nylon) plastic.
- D. PE: Polyethylene plastic.
- E. PP: Polypropylene plastic.
- F. PVC: Polyvinyl chloride plastic.
- G. RTRF: Reinforced thermosetting resin (fiberglass) fittings.
- H. RTRP: Reinforced thermosetting resin (fiberglass) pipe.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.
- B. Field quality-control test reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For water valves and specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
 - 2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
 - 3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.
- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- 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 ASTM F645 for selection, design, and installation of thermoplastic water piping.
- E. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.
- F. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.
 - 1. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372. Include marking "NSF-pw" on piping..

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
 - 1. Ensure that valves are dry and internally protected against rust and corrosion.
 - 2. Protect valves against damage to threaded ends and flange faces.
 - 3. Set valves in best position for handling. Set valves closed to prevent rattling.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- B. During Storage: Use precautions for valves, including fire hydrants, according to the following:
 - 1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
 - 2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
- C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.
- D. Deliver piping 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.
- E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- F. Protect flanges, fittings, and specialties from moisture and dirt.
- G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.9 PROJECT CONDITIONS

- A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:
 - 1. Notify Owner no fewer than two days in advance of proposed interruption of service.
 - 2. Do not proceed with interruption of water-distribution service without Owner's written permission.

1.10 COORDINATION

- A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Application" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372. Include marking "NSF-pw" on piping.

2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B88, Type K and ASTM B88, Type L, water tube, drawn temper.
 - 1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
- B. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
- C. Copper Unions:
 - 1. MSS SP-123.
 - 2. Cast-copper-alloy, hexagonal-stock body.
 - 3. Ball-and-socket, metal-to-metal seating surfaces.
 - 4. Solder-joint or threaded ends.
- D. Copper, Brass or Bronze, Pressure-Seal-Joint Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Apollo Flow Controls; Conbraco Industries, Inc.
 - b. Mueller Industries, Inc.
 - c. NIBCO INC.
 - 2. Fittings: Cast-brass, cast-bronze, or wrought-copper with EPDM O-ring seal in each end. Sizes NPS 2-1/2 and larger with stainless steel grip ring and EPDM O-ring seal.
 - 3. Minimum 200-psig working-pressure rating at 250 deg F.

2.3 DUCTILE-IRON PIPE AND FITTINGS

- A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
 - 1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 - 2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.
 - 1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 - 2. Gaskets: AWWA C111, rubber.
- C. Grooved-Joint, Ductile-Iron Pipe: AWWA C151, with cut, rounded-grooved ends.
 - 1. Grooved-End, Ductile-Iron Pipe Appurtenances:

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Anvil International.
 - 2) Smith-Cooper International.
 - 3) Victaulic Company.
- b. Grooved-End, Ductile-Iron Fittings: ASTM A47/A47M, malleable-iron castings or ASTM A536, ductile-iron castings with dimensions matching pipe.
- c. Grooved-End, Ductile-Iron-Piping Couplings: AWWA C606, for ductile-iron-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.

D. Flanges: ASME 16.1, Class 125, cast iron.

2.4 SPECIAL PIPE FITTINGS

A. Ductile-Iron Rigid Expansion Joints:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. EBAA Iron, Inc.
 - b. U.S. Pipe and Foundry Company.
 - c. Zurn Industries, LLC.
- 2. Description: Three-piece, ductile-iron assembly consisting of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Select and assemble components for expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
 - a. Pressure Rating: 250 psig minimum.
 - b. Expansion Required: **<Insert inches>**.

B. Ductile-Iron Flexible Expansion Joints:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. EBAA Iron, Inc.
 - b. Hays Fluid Controls.
 - c. Star Pipe Products.
 - d. Zurn Industries, LLC.
- 2. Description: Compound, ductile-iron fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections. Assemble components for offset and expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
 - a. Pressure Rating: 250 psig minimum.

- b. Offset: <Insert inches>.
- c. Expansion Required: <Insert inches>.

C. Ductile-Iron Deflection Fittings:

- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. EBAA Iron, Inc.
- 2. Description: Compound, ductile-iron coupling fitting with sleeve and 1 or 2 flexing sections for up to 15-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
 - a. Pressure Rating: 250 psig minimum.

2.5 JOINING MATERIALS

- A. Refer to Section 330500 "Common Work Results for Utilities" for commonly used joining materials.
- B. Brazing Filler Metals: AWS A5.8, BCuP Series.
- C. Bonding Adhesive for Fiberglass Piping: As recommended by fiberglass piping manufacturer.
- D. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

2.6 PIPING SPECIALTIES

- A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
- B. Tubular-Sleeve Pipe Couplings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hays Fluid Controls.
 - b. JCM Industries, Inc.
 - c. Smith-Blair, Inc.
 - d. Viking Johnson.
 - 2. Description: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners and with ends of same sizes as piping to be joined.
 - a. Standard: AWWA C219.
 - b. Center-Sleeve Material: Manufacturer's standard Stainless steel Ductile iron.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- c. Gasket Material: Natural or synthetic rubber.
- d. Pressure Rating: 150 psig minimum.
- e. Metal Component Finish: Corrosion-resistant coating or material.

C. Split-Sleeve Pipe Couplings:

- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Victaulic Company.
- 2. Description: Metal, bolted, split-sleeve-type, reducing or transition coupling with sealing pad and closure plates, O-ring gaskets, and bolt fasteners.
 - a. Standard: AWWA C219.
 - b. Sleeve Material: Manufacturer's standard Stainless steel.
 - c. Sleeve Dimensions: Of thickness and width required to provide pressure rating.
 - d. Gasket Material: O-rings made of EPDM rubber, unless otherwise indicated.
 - e. Pressure Rating: 150 psig minimum.
 - f. Metal Component Finish: Corrosion-resistant coating or material.

D. Flexible Connectors:

- 1. Nonferrous-Metal Piping: Bronze hose covered with bronze wire braid; with copper-tube, pressure-type, solder-joint ends or bronze flanged ends brazed to hose.
- 2. Ferrous-Metal Piping: Stainless-steel hose covered with stainless-steel wire braid; with ASME B1.20.1, threaded steel pipe nipples or ASME B16.5, steel pipe flanges welded to hose.

E. Dielectric Fittings:

- 1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- 2. Dielectric Flanges:
 - a. Description:
 - 1) Standard: ASSE 1079.
 - 2) Factory-fabricated, bolted, companion-flange assembly.
 - 3) Pressure Rating: 150 psig.
 - 4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- 3. Dielectric-Flange Insulating Kits:
 - a. Description:
 - 1) Nonconducting materials for field assembly of companion flanges.
 - 2) Pressure Rating: 150 psig.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- 3) Gasket: Neoprene or phenolic.
 - 4) Bolt Sleeves: Phenolic or polyethylene.
 - 5) Washers: Phenolic with steel backing washers.
4. Dielectric Nipples:
- a. Description:
 - 1) Standard: IAPMO PS 66.
 - 2) Electroplated steel nipple complying with ASTM F1545.
 - 3) Pressure Rating: 300 psig at 225 deg F.
 - 4) End Connections: Male threaded or grooved.
 - 5) Lining: Inert and noncorrosive, propylene.

2.7 CORROSION-PROTECTION PIPING ENCASEMENT

A. Encasement for Underground Metal Piping:

1. Standards: ASTM A674 or AWWA C105.
2. Form: Sheet or tube.
3. Material: LLDPE film of 0.008-inch minimum thickness.
4. Material: LLDPE film of 0.008-inch minimum thickness, or high-density, crosslaminated PE film of 0.004-inch minimum thickness.
5. Material: High-density, crosslaminated PE film of 0.004-inch minimum thickness.
6. Color: Black.

2.8 GATE VALVES

A. AWWA, Cast-Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane; a Crane brand.
 - b. Mueller Co.
 - c. NIBCO INC.
 - d. Zurn Industries, LLC.
2. Nonrising-Stem, Metal-Seated Gate Valves:
 - a. Description: Gray- or ductile-iron body and bonnet; with cast-iron or bronze double-disc gate, bronze gate rings, bronze stem, and stem nut.
 - 1) Standard: AWWA C500.
 - 2) Minimum Pressure Rating: 200 psig.
 - 3) End Connections: Mechanical joint.
 - 4) Interior Coating: Complying with AWWA C550.

2.9 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Cast Iron Pipe Company.
 - b. Clow Valve Company; a subsidiary of McWane, Inc.
 - c. Mueller Co.
 - d. U.S. Pipe and Foundry Company.
2. Description: Sleeve and valve compatible with drilling machine.
 - a. Standard: MSS SP-60.
 - b. Tapping Sleeve: Cast- or ductile-iron or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.
 - c. Valve: AWWA, cast-iron, nonrising-stem, metal-seated gate valve with one raised face flange mating tapping-sleeve flange.

B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches in diameter.

1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

C. Indicator Posts: UL 789, FMG-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve.

2.10 CURB VALVES

A. Manufacturers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ford Meter Box Company, Inc. (The).
 - b. Jones, James Company.
 - c. Master Meter, Inc.
 - d. Mueller Co.

B. Service-Saddle Assemblies: Comply with AWWA C800. Include saddle and valve compatible with tapping machine.

1. Corporation Valve: Bronze body and ground-key plug, with AWWA C800, threaded inlet and outlet matching service piping material.

- C. Curb Valves: Comply with AWWA C800. Include bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.
- D. Service Boxes for Curb Valves: Similar to AWWA M44 requirements for cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over curb valve and with a barrel approximately 3 inches in diameter.
 - 1. Shutoff Rods: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.

2.11 BACKFLOW PREVENTERS

A. Double-Check, Backflow-Prevention Assemblies:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. FEBCO; A WATTS Brand.
 - b. WATTS.
 - c. Wilkins.
 - d. Zurn Industries, LLC.
- 2. Standard: ASSE 1015 or AWWA C510.
- 3. Operation: Continuous-pressure applications, unless otherwise indicated.
- 4. Pressure Loss: 6 psig maximum, through middle 1/3 of flow range.
- 5. Size: 2-1/2 inch.
- 6. Design Flow Rate: 120 gpm.
- 7. Selected Unit Flow Range Limits: 250 gpm.
- 8. Pressure Loss at Design Flow Rate: 5-1/2 psig for NPS 2-1/2 and larger.
- 9. Body: cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
- 10. End Connections: flanged for NPS 2-1/2 and larger.
- 11. Configuration: Designed for horizontal, straight through flow.
- 12. Accessories: Ball valves with threaded ends on inlet and outlet of NPS 2 and smaller; OS&Y gate valves with flanged ends on inlet and outlet of NPS 2-1/2 and larger.

B. Backflow Preventer Test Kits:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. FEBCO; A WATTS Brand.
 - b. WATTS.
 - c. Wilkins.
 - d. Zurn Industries, LLC.
- 2. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Refer to Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

- A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.
- B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.
- C. Do not use flanges or unions for underground piping.
- D. Flanges, unions, grooved-end-pipe couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.
- E. Underground water-service piping NPS 3/4 to NPS 3 shall be the following:
 - 1. Soft copper tube, ASTM B88, Type K ASTM B88, Type L; wrought-copper, solder-joint fittings; and brazed joints.
- F. Aboveground Water-Service Piping NPS 3/4 to NPS 3 shall be the following:
 - 1. Hard copper tube, ASTM B88, Type K ASTM B88, Type L; wrought-copper, solder-joint fittings; and brazed copper, pressure-seal fittings; and pressure-sealed joints.

3.3 VALVE APPLICATIONS

- A. General Application: Use mechanical-joint-end valves for NPS 3 and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 and smaller installation.

3.4 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. See Section 330500 "Common Work Results for Utilities" for piping-system common requirements.

3.5 PIPING INSTALLATION

- A. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.
- B. Make connections larger than NPS 2 with tapping machine according to the following:

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

1. Install tapping sleeve and tapping valve according to MSS SP-60.
 2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
 3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
 4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.
- C. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.
1. Install PE corrosion-protection encasement according to ASTM A674 or AWWA C105.
- D. Bury piping with depth of cover over top at least 48 inches, with top at least 12 inches below level of maximum frost penetration, and according to the following:
1. Under Driveways: With at least 48 inches cover over top.
 2. In Loose Gravelly Soil and Rock: With at least 12 inches additional cover.
- E. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.
- F. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.
1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.
- G. Sleeves are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- H. Mechanical sleeve seals are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- I. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.
- J. See Section 211200 "Fire-Suppression Standpipes," Section 211313 "Wet-Pipe Sprinkler Systems," and Section 211316 "Dry-Pipe Sprinkler Systems" for fire-suppression-water piping inside the building.
- K. See Section 221116 "Domestic Water Piping" for potable-water piping inside the building.
- 3.6 INSTALLATION OF HANGERS AND SUPPORTS
- A. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
- B. Comply with requirements for hangers, supports, and anchor devices specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- C. Install the following pipe attachments:

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

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.
- D. Install hangers for copper tubing with maximum spacing and minimum rod diameters to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- E. Support horizontal piping within 12 inches of each fitting and coupling.
- F. Support vertical runs of copper tubing to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.7 JOINT CONSTRUCTION

- A. See Section 330500 "Common Work Results for Utilities" for basic piping joint construction.
- B. Make pipe joints according to the following:
1. Copper-Tubing, Pressure-Sealed Joints: Join copper tube and pressure-seal fittings with tools and procedures recommended by pressure-seal-fitting manufacturer. Leave insertion marks on pipe after assembly.
 2. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.
 3. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.
 4. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions.
 5. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
 - a. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges flange kits nipples.

3.8 ANCHORAGE INSTALLATION

- A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:
1. Concrete thrust blocks.
 2. Locking mechanical joints.
 3. Set-screw mechanical retainer glands.
 4. Bolted flanged joints.
 5. Heat-fused joints.
 6. Pipe clamps and tie rods.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
 - 1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
 - 2. Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23.
 - 3. Bonded-Joint Fiberglass, Water-Service Piping: According to AWWA M45.
 - 4. Fire-Service-Main Piping: According to NFPA 24.
- C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.9 VALVE INSTALLATION

- A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.
- B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.
- C. UL/FMG, Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.
- D. UL/FMG, Valves Other Than Gate Valves: Comply with NFPA 24.
- E. MSS Valves: Install as component of connected piping system.
- F. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.
- G. Relief Valves: Comply with AWWA C512. Install aboveground with shutoff valve on inlet.

3.10 BACKFLOW PREVENTER INSTALLATION

- A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.
- B. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.
- C. Do not install bypass piping around backflow preventers.
- D. Support NPS 2-1/2 and larger backflow preventers, valves, and piping near floor and on brick or concrete piers.

3.11 CONNECTIONS

- A. See Section 330500 "Common Work Results for Utilities" for piping connections to valves and equipment.

- B. Connect water-distribution piping to existing water main. Use tapping sleeve and tapping valve.
- C. Connect water-distribution piping to interior domestic water piping.
- D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.12 FIELD QUALITY CONTROL

- A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.
 - 1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.
- C. Prepare reports of testing activities.

3.13 IDENTIFICATION

- A. Install continuous underground detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Section 312000 "Earth Moving."
- B. Permanently attach equipment nameplate or marker indicating plastic water-service piping, on main electrical meter panel. See Section 330500 "Common Work Results for Utilities" for identifying devices.

3.14 CLEANING

- A. Clean and disinfect water-distribution piping as follows:
 - 1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
 - 2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
 - 3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
- b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
- c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
- d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports of purging and disinfecting activities.

END OF SECTION 221113

SECTION 221116 - 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 ACTION SUBMITTALS

- A. Product Data: For transition fittings and dielectric fittings.

1.3 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.
- B. Field quality-control reports.

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.
- B. Potable-water piping and components shall comply with NSF 14 and NSF 61. Plastic piping components shall be marked with "NSF-pw."

2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L, water tube, drawn temper.
- B. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- C. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- D. Copper Unions:
 - 1. MSS SP-123.
 - 2. Cast-copper-alloy, hexagonal-stock body.
 - 3. Ball-and-socket, metal-to-metal seating surfaces.
 - 4. Solder-joint or threaded ends.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Sleeve-Type Transition Coupling: AWWA C219.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cascade Waterworks Manufacturing.
 - b. Dresser, Inc.; Piping Specialties Products.
 - c. Ford Meter Box Company, Inc. (The).
 - d. JCM Industries.
 - e. Romac Industries, Inc.
 - f. Smith-Blair, Inc.; a Sensus company.
 - g. Viking Johnson.

2.5 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- a. Capitol Manufacturing Company; member of the Phoenix Forge Group.
 - b. Central Plastics Company.
 - c. Hart Industries International, Inc.
 - d. Jomar International.
 - e. Matco-Norca.
 - f. McDonald, A. Y. Mfg. Co.
 - g. Watts; a division of Watts Water Technologies, Inc.
 - h. Wilkins; a Zurn company.
2. Standard: ASSE 1079.
 3. Pressure Rating: 150 psig.
 4. 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:
 - a. Capitol Manufacturing Company; member of the Phoenix Forge Group.
 - b. Central Plastics Company.
 - c. Matco-Norca.
 - d. Watts; a division of Watts Water Technologies, Inc.
 - e. Wilkins; a Zurn company.
 2. Standard: ASSE 1079.
 3. Factory-fabricated, bolted, companion-flange assembly.
 4. Pressure Rating: 150 psig.
 5. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- D. Dielectric-Flange Insulating 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. Nonconducting materials for field assembly of companion flanges.
 3. Pressure Rating: 150 psig.
 4. Gasket: Neoprene or phenolic.
 5. Bolt Sleeves: Phenolic or polyethylene.
 6. Washers: Phenolic with steel backing washers.
- E. Dielectric Nipples:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- a. Elster Perfection Corporation.
 - b. Grinnell Mechanical Products; Tyco Fire Products LP.
 - c. Matco-Norca.
 - d. Precision Plumbing Products, Inc.
 - e. Victaulic Company.
2. Standard: IAPMO PS 66.
 3. Electroplated steel nipple complying with ASTM F 1545.
 4. Pressure Rating and Temperature: 300 psig at 225 deg.
 5. End Connections: Male threaded or grooved.
 6. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Comply with requirements in Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

3.2 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 shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Division 22 Section "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Division 22 Section "Domestic Water Piping Specialties."
- C. Install shutoff valve immediately upstream of each dielectric fitting.
- D. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.
- E. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- F. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- G. 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.
- H. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- I. Install piping to permit valve servicing.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- J. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the 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, machine, and specialty.
- N. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Division 22 Section "Meters and Gages for Plumbing Piping."
- O. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Division 22 Section "Domestic Water Pumps."
- P. Install thermometers on inlet and outlet piping from each water heater. Comply with requirements for thermometers in Division 22 Section "Meters and Gages for Plumbing Piping."
- Q. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."
- R. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."
- S. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Section "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Braze Joints" chapter.
- D. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- 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.

3.4 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Underground Domestic Water Piping:
 - 1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
 - 2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

3.5 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 flange kits.

3.6 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for pipe hanger, support products, and installation in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service 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. Domestic Water Circulation Pumps: suction and discharge piping.
 - 2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 - 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.

3.8 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Division 22 Section "Identification for Plumbing Piping and Equipment."
- B. Label pressure piping with system operating pressure.

3.9 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:

1. Piping Inspections:

- a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
- b. 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:
 - 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 authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph 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.

2. Piping Tests:

- a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
- b. 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.
- c. 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.
- d. 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 it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
- e. 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.

- B. Domestic water piping will be considered defective if it does not pass tests and inspections.

- C. Prepare test and inspection reports.

3.10 ADJUSTING

- A. Perform the following adjustments before operation:
 - 1. Close drain valves, hydrants, 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 hot-water flow 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. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
 - 8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 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. Repeat procedures if biological examination shows contamination.
 - e. Submit water samples in sterile bottles to authorities having jurisdiction.
- B. Clean non-potable domestic water piping as follows:

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

CW: Cold Water

D: Drain

System	Location / Exposure	Pipe Size (Inch)	Material	Joint	Encasement
CW	Indoor Aboveground	Up to 3	Type L Copper	Solder	None
D		Up to 2	Type L Copper	Solder	None

- A. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

3.13 VALVE SCHEDULE

- A. Refer to section 220523, "General-Duty Valves for Plumbing Piping."

END OF SECTION 221116

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SECTION 221119 - 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. Section Includes:

- 1. Strainers.
- 2. Drain valves.
- 3. Water-hammer arresters.
- 4. Air vents.

B. Related Requirements:

- 1. Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For domestic water piping specialties.
 - 1. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- A. Potable-water piping and components shall comply with NSF 61.

2.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 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 that complies with AWWA C550 or that is FDA approved, epoxy coated 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: 0.033 inch.
 - b. Strainers NPS 2-1/2 to NPS 4: 0.062 inch.
6. Drain: Factory-installed, hose-end drain valve.

2.4 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.

2.5 WATER-HAMMER ARRESTERS

- A. Water-Hammer:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product:

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- a. Watts Model LF 15
2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.6 AIR VENTS

A. Bolted-Construction Automatic Air Vents:

1. Body: Bronze.
2. Pressure Rating and Temperature: 125-psig minimum pressure rating at 140 deg F.
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 1/2 minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install balancing valves in locations where they can easily be adjusted.
- B. Install Y-pattern strainers for water on supply side of each control valve, water pressure-reducing valve, and pump.
- C. Install water-hammer arresters in water piping according to PDI-WH 201.
- D. Install air vents at high points of water piping. Install drain piping and discharge onto floor drain.

3.2 CONNECTIONS

- A. Comply with requirements for piping specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Comply with requirements for ground equipment in Division 26 Section "Grounding and Bonding for Electrical Systems."

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. Calibrated balancing valves.
 2. Thermostatic, water mixing 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

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

identifying unit. Nameplates and signs are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

Retain "Perform the following tests and inspections" Paragraph below to require Contractor to perform tests and inspections.

- A. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
- B. Prepare test and inspection reports.

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 221119

SECTION 221313 - FACILITY SANITARY SEWERS

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. Hub-and-spigot, cast-iron soil pipe and fittings.
 - 2. Hubless cast-iron soil pipe and fittings.
 - 3. Ductile-iron, gravity sewer pipe and fittings.
 - 4. Ductile-iron, pressure pipe and fittings.
 - 5. Nonpressure-type transition couplings.
 - 6. Pressure-type pipe couplings.
 - 7. Expansion joints and deflection fittings.
 - 8. Cleanouts.

1.3 DEFINITIONS

- A. FRP: Fiberglass-reinforced plastic.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Pipe and fittings.
 - 2. Non-pressure and pressure couplings
 - 3. Expansion joints and deflection fittings.
 - 4. Backwater valves.
 - 5. Cleanouts.
- B. Shop Drawings: For manholes. Include plans, elevations, sections, details, and frames and covers.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings:

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

1. Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from sewer system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.
2. Show system piping in profile. Draw profiles to horizontal scale of not less than 1 inch equals 50 feet and to vertical scale of not less than 1 inch equals 5 feet. Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.

B. Product Certificates: For each type of pipe and fitting.

C. Field quality-control reports.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

1.7 FIELD CONDITIONS

A. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Owner's written permission.

PART 2 - PRODUCTS

2.1 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A74, Extra-Heavy class

B. Gaskets: ASTM C564, rubber.

C. Calking Materials: ASTM B29, pure lead and oakum or hemp fiber.

2.2 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A888 or CISPI 301.

B. CISPI-Trademark, Shielded Couplings:

1. Description: ASTM C1277 and CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

C. Heavy-Duty, Shielded Couplings:

1. Description: ASTM C1277 and ASTM C1540, with stainless-steel shield; stainless-steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

D. Cast-Iron, Shielded Couplings:

1. Description: ASTM C1277 with ASTM A48/A48M, two-piece, cast-iron housing; stainless-steel bolts and nuts; and ASTM C564, rubber sleeve with integral, center pipe stop.

E. Unshielded Couplings:

1. Description: ASTM C1277 and ASTM C1461, rigid, sleeve-type, reducing- or transition-type mechanical coupling, with integral, center pipe stop, molded from ASTM C1440, thermoplastic elastomer (TPE) material; with corrosion-resistant-metal tension band and tightening mechanism on each end.

2.3 DUCTILE-IRON, GRAVITY SEWER PIPE AND FITTINGS

- A. Pipe: ASTM A746, for push-on joints.
- B. Standard Fittings: AWWA C110/A21.10, ductile or gray iron, for push-on joints.
- C. Compact Fittings: AWWA C153/A21.53, ductile iron, for push-on joints.
- D. Gaskets: AWWA C111/A21.11, rubber.

2.4 DUCTILE-IRON, PRESSURE PIPE AND FITTINGS

A. Push-on-Joint Piping:

1. Pipe: AWWA C151/A21.51.
2. Standard Fittings: AWWA C110/A21.10, ductile or gray iron.
3. Compact Fittings: AWWA C153/A21.53.
4. Gaskets: AWWA C111/A21.11, rubber, of shape matching pipe and fittings.

B. Mechanical-Joint Piping:

1. Pipe: AWWA C151/A21.51, with bolt holes in bell.
2. Standard Fittings: AWWA C110/A21.10, ductile or gray iron, with bolt holes in bell.
3. Compact Fittings: AWWA C153/A21.53, with bolt holes in bells.
4. Glands: Cast or ductile iron; with bolt holes and high-strength, cast-iron or high-strength, low-alloy steel bolts and nuts.
5. Gaskets: AWWA C111/A21.11, rubber, of shape matching pipe, fittings, and glands.

2.5 NONPRESSURE-TYPE TRANSITION COUPLINGS

- A. Comply with ASTM C1173, elastomeric, sleeve-type, reducing or transition coupling; for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and include corrosion-resistant-metal tension band and tightening mechanism on each end.
- B. Sleeve Materials:
 - 1. For Cast-Iron Soil Pipes: ASTM C564, rubber.
 - 2. For Concrete Pipes: ASTM C443, rubber.
 - 3. For Fiberglass Pipes: ASTM F477, elastomeric seal or ASTM D5926, PVC.
 - 4. For Plastic Pipes: ASTM F477, elastomeric seal or ASTM D5926, PVC.
 - 5. For Dissimilar Pipes: ASTM D5926, PVC or other material compatible with pipe materials being joined.
- C. Unshielded, Flexible Couplings:
 - 1. Description: Elastomeric sleeve with[stainless-steel shear ring and] corrosion-resistant-metal tension band and tightening mechanism on each end.
- D. Shielded, Flexible Couplings:
 - 1. Description: ASTM C1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
- E. Ring-Type, Flexible Couplings:
 - 1. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.
- F. Nonpressure-Type, Rigid Couplings:
 - 1. Description: ASTM C1461, sleeve-type, reducing- or transition-type mechanical coupling; molded from ASTM C1440, TPE material; with corrosion-resistant-metal tension band and tightening mechanism on each end.

2.6 PRESSURE-TYPE PIPE COUPLINGS

- A. Tubular-Sleeve Couplings: AWWA C219, with center sleeve, gaskets, end rings, and bolt fasteners.
- B. Metal, bolted, sleeve-type, reducing or transition coupling; for joining underground pressure piping. Include 150-psig minimum pressure rating and ends of same sizes as piping to be joined.
- C. Center-Sleeve Material: Ductile iron
- D. Gasket Material: Natural or synthetic rubber.
- E. Metal Component Finish: Corrosion-resistant coating or material.

2.7 EXPANSION JOINTS AND DEFLECTION FITTINGS

A. Ductile-Iron, Flexible Expansion Joints:

1. Description: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110/A21.10 or AWWA C153/A21.53. Include two gasketed ball-joint sections and one or more gasketed sleeve sections, rated for 250-psig minimum working pressure and for offset and expansion indicated.

B. Ductile-Iron Expansion Joints:

1. Description: Three-piece assembly of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110/A21.10 or AWWA C153/A21.53. Include rating for 250-psig minimum working pressure and for expansion indicated.

C. Ductile-Iron Deflection Fittings:

1. Description: Compound coupling fitting with ball joint, flexing section, gaskets, and restrained-joint ends complying with AWWA C110/A21.10 or AWWA C153/A21.53. Include rating for 250-psig minimum working pressure and for up to 15 degrees of deflection.

2.8 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
2. Top-Loading Classification(s): Heavy Duty
3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A74, Service class, cast-iron soil pipe and fittings.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details to indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.
- C. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- D. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.
- E. Install gravity-flow, nonpressure, drainage piping according to the following:
 - 1. Install piping pitched down in direction of flow, at minimum slope of 2 percent unless otherwise indicated.
 - 2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place-concrete supports or anchors.
 - 3. Install piping with 48-inch minimum cover.
 - 4. Install hub-and-spigot, cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
 - 5. Install hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
 - 6. Install ductile-iron, gravity sewer piping according to ASTM A746.
- F. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A674 or AWWA C105/A21.5:
 - 1. Hub-and-spigot, cast-iron soil pipe.
 - 2. Hubless cast-iron soil pipe and fittings.
 - 3. Ductile-iron pipe and fittings.
 - 4. Expansion joints and deflection fittings.
- G. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.3 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, nonpressure, drainage piping according to the following:
 - 1. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
 - 2. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.
 - 3. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
 - 4. Join ductile-iron, gravity sewer piping according to AWWA C600 for push-on joints.
 - 5. Join dissimilar pipe materials with nonpressure-type, flexible or rigid couplings.

- B. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
 - 1. Use nonpressure flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
 - a. Shielded flexible or rigid couplings for pipes of same or slightly different OD.
 - b. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.4 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts, and use cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
 - 1. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
 - 2. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads.
- B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding grade when not hazard.
- C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.5 CONNECTIONS

- A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drains specified in Section 221316 "Sanitary Waste and Vent Piping."
- B. Make connections to existing piping and underground manholes.
 - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch overlap with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
 - 2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
 - 3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes by cutting opening into existing unit large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of, and be flush with, inside wall unless otherwise indicated. On outside of pipe or manhole wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.
 - a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.

- b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
4. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.6 IDENTIFICATION

- A. Comply with requirements in Section 312000 "Earth Moving" for underground utility identification devices. Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.
 1. Use warning tape or detectable warning tape over ferrous piping.
 2. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

3.7 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
 1. Submit separate report for each system inspection.
 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 1. Do not enclose, cover, or put into service before inspection and approval.
 2. Test completed piping systems according to requirements of authorities having jurisdiction.
 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 4. Submit separate report for each test.
 5. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- a. Fill sewer piping with water. Test with pressure of at least 10-foot head of water, and maintain such pressure without leakage for at least 15 minutes.
 - b. Close openings in system and fill with water.
 - c. Purge air and refill with water.
 - d. Disconnect water supply.
 - e. Test and inspect joints for leaks.
6. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
- a. Test plastic gravity sewer piping according to ASTM F1417.
 - b. Test concrete gravity sewer piping according to ASTM C1628.
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.8 CLEANING

- A. Clean dirt and superfluous material from interior of piping. Flush with potable water.

END OF SECTION 221313

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SECTION 221316 - 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. Section Includes:

- 1. Pipe, tube, and fittings.
- 2. Specialty pipe fittings.
- 3. Encasement for underground metal piping.

B. Related Sections:

- 1. Division 22 Section "Facility Sanitary Sewers" for sanitary sewerage piping and structures outside the building.
- 2. Division 22 Section "Sanitary Sewerage Pumps" for effluent and sewage pumps.
- 3. Division 22 Section "Chemical-Waste Systems for Laboratory and Healthcare Facilities" for chemical-waste and vent piping systems.

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.

- B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, and details.

1.5 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of sanitary waste service.
2. Do not proceed with interruption of sanitary waste service without Owner'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 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74,
- B. Gaskets: ASTM C 564, rubber.
- C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- B. Sovent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and deaerator drainage fittings.
- C. CISPI, Hubless-Piping Couplings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ANACO-Husky.
 - b. Dallas Specialty & Mfg. Co.
 - c. Fernco Inc.
 - d. Matco-Norca, Inc.
 - e. MIFAB, Inc.
 - f. Mission Rubber Company; a division of MCP Industries, Inc.
 - g. Stant.
 - h. Tyler Pipe.
 2. Standards: ASTM C 1277 and CISPI 310.
 3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.
- D. Heavy-Duty, Hubless-Piping Couplings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ANACO-Husky.
 - b. Clamp-All Corp.
 - c. Dallas Specialty & Mfg. Co.
 - d. MIFAB, Inc.
 - e. Mission Rubber Company; a division of MCP Industries, Inc.
 - f. Stant.
 - g. Tyler Pipe.
 2. Standards: ASTM C 1277 and ASTM C 1540.
 3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.
- E. Cast-Iron, Hubless-Piping Couplings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. MG Piping Products Company.
 2. Standard: ASTM C 1277.
 3. Description: Two-piece ASTM A 48/A 48M, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 GALVANIZED-STEEL PIPE AND FITTINGS

- A. Galvanized-Steel Pipe: ASTM A 53/A 53M, Type E, Standard Weight class. Include square-cut-grooved or threaded ends matching joining method.
- B. Galvanized-Cast-Iron Drainage Fittings: ASME B16.12, threaded.
- C. Steel Pipe Pressure Fittings:
 - 1. Galvanized-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106/A 106M, Schedule 40, seamless steel pipe. Include ends matching joining method.
 - 2. Malleable-Iron Unions: ASME B16.39; Class 150; hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface; and female threaded ends.
 - 3. Galvanized-Gray-Iron, Threaded Fittings: ASME B16.4, Class 125, standard pattern.
- D. Cast-Iron Flanges: ASME B16.1, Class 125.
 - 1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - 2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

2.5 COPPER TUBE AND FITTINGS

- A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
- B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
- C. Hard Copper Tube: ASTM B 88, Type L and Type M, water tube, drawn temper.
- D. Soft Copper Tube: ASTM B 88, Type L, water tube, annealed temper.
- E. Copper Pressure Fittings:
 - 1. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 - 2. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
- F. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
 - 1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - 2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- G. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.6 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
3. Unshielded, Nonpressure Transition Couplings:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Dallas Specialty & Mfg. Co.
 - 2) Fernco Inc.
 - 3) Mission Rubber Company; a division of MCP Industries, Inc.
 - 4) Plastic Oddities; a division of Diverse Corporate Technologies, Inc.
 - b. Standard: ASTM C 1173.
 - c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - d. Sleeve Materials:
 - 1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
 - 2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - 3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
2. Shielded, Nonpressure Transition Couplings:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
 - 1) Cascade Waterworks Mfg. Co.
 - 2) Mission Rubber Company; a division of MCP Industries, Inc.
 - b. Standard: ASTM C 1460.
 - c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
2. Pressure Transition Couplings:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Cascade Waterworks Mfg. Co.
 - 2) Dresser, Inc.
 - 3) EBAA Iron, Inc.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- 4) JCM Industries, Inc.
- 5) Romac Industries, Inc.
- 6) Smith-Blair, Inc.; a Sensus company.
- 7) The Ford Meter Box Company, Inc.
- 8) Viking Johnson.

- b. Standard: AWWA C219.
- c. Description: Metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
- d. Center-Sleeve Material: [Manufacturer's standard]
- e. Gasket Material: Natural or synthetic rubber.
- f. Metal Component Finish: Corrosion-resistant coating or material.

B. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

2. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1) Capitol Manufacturing Company.
- 2) Central Plastics Company.
- 3) Hart Industries International, Inc.
- 4) Jomar International Ltd.
- 5) Matco-Norca, Inc.
- 6) McDonald, A. Y. Mfg. Co.
- 7) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
- 8) Wilkins; a Zurn company.

b. Description:

- 1) Standard: ASSE 1079.
- 2) Pressure Rating: 125 psig minimum at 180 deg F
- 3) End Connections: Solder-joint copper alloy and threaded ferrous.

2. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1) Capitol Manufacturing Company.
- 2) Central Plastics Company.
- 3) Matco-Norca, Inc.
- 4) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
- 5) Wilkins; a Zurn company.

b. Description:

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- 1) Standard: ASSE 1079.
- 2) Factory-fabricated, bolted, companion-flange assembly.
- 3) Pressure Rating: 125 psig minimum at 180 deg F.
- 4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

2. Dielectric-Flange Insulating Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1) Advance Products & Systems, Inc.
- 2) Calpico, Inc.
- 3) Central Plastics Company.
- 4) Pipeline Seal and Insulator, Inc.

b. Description:

- 1) Nonconducting materials for field assembly of companion flanges.
- 2) Pressure Rating: 150 psig
- 3) Gasket: Neoprene or phenolic.
- 4) Bolt Sleeves: Phenolic or polyethylene.
- 5) Washers: Phenolic with steel backing washers.

2. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1) Elster Perfection.
- 2) Grinnell Mechanical Products.
- 3) Matco-Norca, Inc.
- 4) Precision Plumbing Products, Inc.
- 5) Victaulic Company.

b. Description:

- 1) Standard: IAPMO PS 66
- 2) Electroplated steel nipple.
- 3) Pressure Rating: 300 psig at 225 deg F
- 4) End Connections: Male threaded or grooved.
- 5) Lining: Inert and noncorrosive, propylene.

2.7 ENCASEMENT FOR UNDERGROUND METAL PIPING

- A. Standard: ASTM A 674 or AWWA C105/A 21.5.
- B. Material: Linear low-density polyethylene film of 0.008-inch minimum thickness.
- C. Form: Sheet tube.

- D. Color: Black or natural

PART 3 - EXECUTION

3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Division 31 Section "Earth Moving."

3.2 PIPING INSTALLATION

- A. 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.
- 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. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- K. 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 two 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.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- L. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- M. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Sanitary Drain: ¼" per foot percent downward in direction of flow for piping NPS 2-1/2 and smaller; 1/8" per foot downward in direction of flow for piping NPS 3 and larger.
 - 2. Horizontal Sanitary Drainage Piping: ¼" per foot percent downward in direction of flow for piping NPS 2-1/2 and smaller; 1/8" per foot downward in direction of flow for piping NPS 3 and larger.
 - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- N. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
 - 1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.
- O. Install steel piping according to applicable plumbing code.
- P. Plumbing Specialties:
 - 1. Install backwater valves in sanitary waster gravity-flow piping. Comply with requirements for backwater valves specified in Division 22 Section "Sanitary Waste Piping Specialties."
 - 2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping. Comply with requirements for cleanouts specified in Division 22 Section "Sanitary Waste Piping Specialties."
 - 3. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Division 22 Section "Sanitary Waste Piping Specialties."
- Q. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- R. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."
- S. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

- T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Section "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

- A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- B. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum calked joints.
- C. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- 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. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.
- F. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.
- G. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

3.4 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
 - 1. Install transition couplings at joints of piping with small differences in OD's.
 - 2. In Drainage Piping: Shielded, nonpressure transition couplings.
- B. Dielectric Fittings:
 - 1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
 - 2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples or unions.
 - 3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.
 - 4. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for pipe hanger and support devices and installation specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
 - 2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
 - 3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
 - 4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
 - 5. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 6. Install individual, straight, horizontal piping runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
 - 7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 8. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- F. 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 and NPS 8: 60 inches with 3/4-inch rod.
 - 5. NPS 10 and NPS 12: 60 inches with 7/8-inch rod.
 - 6. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.
- G. Install supports for vertical cast-iron soil piping every 15 feet.
- H. 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.
 - 6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

7. NPS 6 and NPS 8: 12 feet with 3/4-inch rod.
 8. NPS 10 and NPS 12: 12 feet with 7/8-inch rod.
- I. Install supports for vertical steel piping every 15 feet.
 - J. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 1. NPS 1-1/4: 72 inches with 3/8-inch rod.
 2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 3. NPS 2-1/2: 108 inches with 1/2-inch rod.
 4. NPS 3 and NPS 5: 10 feet with 1/2-inch rod.
 5. NPS 6: 10 feet with 5/8-inch rod.
 6. NPS 8: 10 feet with 3/4-inch rod.
 - K. Install supports for vertical copper tubing every 10 feet.
 - L. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior 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 Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
 4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
 5. 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.
- D. Connect force-main piping to the following:
 1. Sanitary Sewer: To exterior force main.
 2. Sewage Pump: To sewage pump discharge.
- E. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- F. Make connections according to the following unless otherwise indicated:

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.7 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.8 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.

3.9 CLEANING AND PROTECTION

- 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.

3.10 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping NPS 4 and smaller shall be the following:
 - 1. Hubless, cast-iron soil pipe and fittings, hubless-piping couplings; and coupled joints.
 - 2. Galvanized-steel pipe, drainage fittings, and threaded joints.
- C. Aboveground, vent piping NPS 4 and smaller shall be the following:
 - 1. Hubless, cast-iron soil pipe and fittings; hubless-piping couplings; and coupled joints.
 - 2. Galvanized-steel pipe, drainage fittings, and threaded joints.
- D. Underground, soil, waste, and vent piping NPS 4 and smaller shall be the following:
 - 1. Service class, cast-iron soil piping; gaskets; and calking materials; and calked joints.
 - 2. Hubless, cast-iron soil pipe and fittings; cast-iron] hubless-piping couplings; and coupled joints.

END OF SECTION 221316

SECTION 221319 - 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. Section Includes:
 - 1. Cleanouts.
 - 2. Floor drains.
 - 3. Through-penetration firestop assemblies.
 - 4. Miscellaneous sanitary drainage piping specialties.

1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. FOG: Fats, oils, and greases.
- C. FRP: Fiberglass-reinforced plastic.
- D. HDPE: High-density polyethylene plastic.
- E. PE: Polyethylene plastic.
- F. PP: Polypropylene plastic.
- G. PVC: Polyvinyl chloride plastic.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:
- B. Shop Drawings: Show fabrication and installation details for frost-resistant vent terminals.
 - 1. Wiring Diagrams: Power, signal, and control wiring.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.
- 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 NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.7 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 CLEANOUTS

- A. Exposed Metal Cleanouts :
 - 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:
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 3. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product 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.
 - 4. Standard: ASME A112.36.2M for cast iron for cleanout test tee.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

5. Size: Same as connected drainage piping
6. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
7. Closure: cast-iron plug.
8. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
9. Closure: Stainless-steel plug with seal.

B. Metal Floor Cleanouts:

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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
 - a. Josam Company; Josam Div.
 - b. Oatey.
 - c. Sioux Chief Manufacturing Company, 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; Light Commercial Operation.
 - h. Zurn Plumbing Products Group; Specification Drainage Operation.
4. Standard: ASME A112.36.2M for heavy-duty, adjustable housing, threaded, adjustable housing cleanout.
5. Size: Same as connected branch.
6. Type: Heavy-duty, adjustable housing, Threaded, adjustable housing].
7. Body or Ferrule: Cast iron
8. Clamping Device: Required.
9. Outlet Connection: Inside calk, Spigot, Threaded.
10. Closure: Brass plug with straight threads and gasket, ABS tapered thread plug.
11. Adjustable Housing Material: Cast iron with threads.
12. Frame and Cover Material and Finish: [Nickel-bronze, copper alloy] Frame and Cover Shape: Round.
13. Top Loading Classification: Heavy Duty.
14. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.
15. Standard: ASME A112.3.1.
16. Size: Same as connected branch.
17. Housing: Stainless steel.
18. Closure: Stainless steel with seal.
19. Riser: Stainless-steel drainage pipe fitting to cleanout.

C. Cast-Iron Wall Cleanouts:

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:

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product 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.
4. Standard: ASME A112.36.2M. Include wall access.
5. Size: Same as connected drainage piping.
6. Body: cast-iron soil pipe T-branch as required to match connected piping.
7. Closure: drilled-and-threaded plug.
8. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
9. Wall Access: Round, stainless-steel cover plate with screw.
10. Wall Access: Round stainless-steel wall-installation frame and cover.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains :

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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
 - a. Commercial Enameling Co.
 - b. Josam Company; Josam Div.
 - c. MIFAB, Inc.
 - d. Prier Products, Inc.
 - e. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - f. Tyler Pipe; Wade Div.
 - g. Watts Drainage Products Inc.
 - h. Zurn Plumbing Products Group; Light Commercial Operation.
 - i. Zurn Plumbing Products Group; Specification Drainage Operation.
4. Standard: ASME A112.6.3.
5. Pattern: Floor drain.
6. Body Material: Cast iron.
7. Clamping Device: Required.
8. Outlet: Bottom.
9. Top or Strainer Material: Nickel bronze.
10. Top of Body and Strainer Finish: Nickel bronze
11. Top Shape: Square.

12. Top Loading Classification: Light Duty.

2.3 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:

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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ProSet Systems Inc.
3. Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.
4. Size: Same as connected soil, waste, or vent stack.
5. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
6. Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern, wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
7. Special Coating: Corrosion resistant on interior of fittings.

2.4 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

B. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

C. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 1 inch above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

D. Stack Flashing Fittings:

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

E. Vent Caps:

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

2.5 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.

B. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz./sq. ft.
2. Vent Pipe Flashing: 8 oz./sq. ft.

C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.

D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

E. Fasteners: Metal compatible with material and substrate being fastened.

F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

G. Solder: ASTM B 32, lead-free alloy.

H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

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 for piping NPS 4 and smaller and 100 feet for larger piping.
 4. Locate at base of each vertical soil and waste stack.
- B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- 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 stack air-admittance valves at top of stack vent and vent stack piping.
- F. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.
- G. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.
- H. Install through-penetration firestop assemblies in plastic conductors and stacks at floor penetrations.
- I. Assemble open drain fittings and install with top of hub 1 inch above floor.
- J. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
 2. Size: Same as floor drain inlet.
- K. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- L. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.
- M. Install vent caps on each vent pipe passing through roof.
- N. Install frost-resistant vent terminals on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.
- O. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

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 FLASHING INSTALLATION

- A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
 - 1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.
 - 2. Copper Sheets: Solder joints of copper sheets.
- B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
 - 1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
 - 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
 - 3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.
- C. Set flashing on floors and roofs in solid coating of bituminous cement.
- D. Secure flashing into sleeve and specialty clamping ring or device.
- E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 07 Section "Sheet Metal Flashing and Trim."
- F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.
- G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

3.4 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on equipment.
- 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."

3.5 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 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.

3.6 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 221319

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SECTION 221319.13 - SANITARY DRAINS

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. Floor drains.

1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene styrene.
- B. FRP: Fiberglass-reinforced plastic.
- C. HDPE: High-density polyethylene.
- D. PE: Polyethylene.
- E. PP: Polypropylene.
- F. PVC: Polyvinyl chloride.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 DRAIN ASSEMBLIES

- A. Sanitary drains shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14 for plastic sanitary piping specialty components.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. Standard: ASME A112.6.3[**with backwater valve**].
2. Pattern: **Floor** drain.
3. Body Material: **Gray iron**
4. Seepage Flange: **Required**
5. Anchor Flange: **Required**
6. Clamping Device: **Required**
7. Outlet: **Bottom**
8. Coating on Interior and Exposed Exterior Surfaces: **Acid-resistant enamel**
9. Sediment Bucket: **required**
10. Top or Strainer Material: **Nickel bronze**
11. Top of Body and Strainer Finish: **Nickel bronze**
12. Top Shape: **Square**
13. Dimensions of Top or Strainer: 8"
14. Top Loading Classification: **Heavy Duty**
15. Funnel: **Not required**
16. Inlet Fitting: [**Gray iron, with threaded inlet and threaded or spigot outlet**
17. Trap Material: **Cast iron.**
18. Trap Pattern: **Deep-seal P-trap**

PART 3 - EXECUTION

3.1 INSTALLATION

- A. 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.
 3. 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.
 4. Install floor-drain flashing collar or flange, so no leakage occurs between drain and adjoining flooring.
 - a. Maintain integrity of waterproof membranes where penetrated.
 5. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

3.2 CONNECTIONS

- A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Comply with requirements in Section 221319 "Sanitary Waste Piping Specialties" for backwater valves, air admittance devices and miscellaneous sanitary drainage piping specialties.
- C. Comply with requirements in Section 221323 "Sanitary Waste Interceptors" for grease interceptors, grease-removal devices, oil interceptors, sand interceptors, and solid interceptors.
- D. Install piping adjacent to equipment to allow service and maintenance.
- E. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- F. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 LABELING AND IDENTIFYING

- A. 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 Section 220553 "Identification for Plumbing Piping and Equipment."

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 221319.13

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SECTION 221329 - SANITARY SEWERAGE PUMPS

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. Submersible sump pumps.
 - 2. Sump-pump basins.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
 - 1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For pumps and controls, to include in operation and maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Retain shipping flange protective covers and protective coatings during storage.
- B. Protect bearings and couplings against damage.
- C. Comply with manufacturer's written instructions for handling.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. 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.
- B. UL Compliance: Comply with UL 778 for motor-operated water pumps.
 - 1. Diameter: 14.75 inches.
 - 2. Depth: 14.1 inches.

2.2 PACKAGED DRAINAGE-PUMP UNITS

- A. Packaged Submersible Drainage-Pump Unit:
 - 1. Description: Factory-assembled and tested, automatic-operation, freestanding, sump-pump unit .
 - 2. Basis of selection, Liberty Pumps model 404.
 - 3. Pump Type: Wet-pit-volute, single-stage, separately coupled, overhung-impeller centrifugal pump.
 - 4. Pump Casing: Corrosion-resistant material, with strainer inlet, design that permits flow into impeller, and vertical discharge for piping connection.
 - 5. Impeller: Aluminum, brass, or plastic.
 - 6. Motor: With built-in overload protection.
 - 7. Power Cord: Three-conductor, waterproof cable of length required, but not less than 10 feet), with grounding plug and cable-sealing assembly for connection at pump.
 - 8. Control: Float switch.
 - 9. Pump Discharge Piping: field fabricated,.
 - 10. Control: Motor-mounted float switch.
- B. Pump Basin:
 - 1. Basin: 14.75" diameter X 14.1" deep fiberglass basin to be installed under pantry sink.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for plumbing piping to verify actual locations of piping connections before drain pump installation.

3.2 CONNECTIONS

- A. Comply with requirements for piping specified in Section 221316 "Sanitary Waste and Vent Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

- B. Where installing piping adjacent to equipment, allow space for service and maintenance.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Perform each visual and mechanical inspection.
 - 2. Leak Test: After installation, charge system 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.
- B. Pumps and controls will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Adjust pumps to function smoothly and lubricate as recommended by manufacturer.
- B. Adjust control set points.

END OF SECTION 221329

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SECTION 221513 - GENERAL-SERVICE COMPRESSED-AIR PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes piping and related specialties for general-service compressed-air systems operating at 150 psig or less.
- B. See Section 221519 "General-Service Packaged Air Compressors and Receivers" for general-service air compressors and accessories.

1.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Compressed-air piping and support and installation shall withstand effects of seismic events determined according to SEI/ASCE 7, "Minimum Design Loads for Buildings and Other Structures."

1.3 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Pressure regulators. Include rated capacities and operating characteristics.
 - 2. Automatic drain valves.
 - 3. Filters. Include rated capacities and operating characteristics.
 - 4. Lubricators. Include rated capacities and operating characteristics.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control test reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for low-pressure compressed-air piping.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B, black with ends threaded according to ASME B1.20.1.
 - 1. Steel Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, galvanized seamless steel pipe. Include ends matching joining method.
 - 2. Malleable-Iron Fittings: ASME B16.3, Class 150 or 300, threaded.
 - 3. Malleable-Iron Unions: ASME B16.39, Class 150 or 300, threaded.
 - 4. Steel Flanges: ASME B16.5, Class 150 or 300, carbon steel, threaded.
 - 5. Wrought-Steel Butt-Welding Fittings: ASME B16.9, Schedule 40.
 - 6. Steel Flanges: ASME B16.5, Class 150 or 300, carbon steel.
- B. Transition Couplings for Metal Piping: Metal coupling or other manufactured fitting same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.2 JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for compressed-air piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, full-face, asbestos free, 1/8-inch maximum thickness.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated.
- E. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer complying with ASTM F 656.

2.3 VALVES

- A. Metal Ball, Butterfly, Check, and Gate Valves: Comply with requirements in Section 210523 "General Duty Valves for Water Based Fire-Suppression Piping."

2.4 DIELECTRIC FITTINGS

- A. General Requirements for Dielectric Fittings: Combination fitting of copper alloy and ferrous materials with insulating material; suitable for system fluid, pressure, and temperature. Include threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

- B. Dielectric Unions: Factory-fabricated union assembly, for 250-psig minimum working pressure at 180 deg F.

2.5 FLEXIBLE PIPE CONNECTORS

- A. Stainless-Steel-Hose Flexible Pipe Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.
 - 1. Working-Pressure Rating: 200 psig minimum.
 - 2. End Connections, NPS 2 and Smaller: Threaded steel pipe nipple.
 - 3. End Connections, NPS 2-1/2 and Larger: Flanged steel nipple.

2.6 SPECIALTIES

- A. Safety Valves: ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," construction; National Board certified, labeled, and factory sealed; constructed of bronze body with poppet-type safety valve for compressed-air service.
 - 1. Pressure Settings: Higher than discharge pressure and same or lower than receiver pressure rating.
- B. Air-Main Pressure Regulators: Bronze body, direct acting, spring-loaded manual pressure-setting adjustment, and rated for 250-psig inlet pressure, unless otherwise indicated.
- C. Air-Line Pressure Regulators: Diaphragm operated, bronze body, direct acting, spring-loaded manual pressure-setting adjustment, and rated for 200-psig minimum inlet pressure, unless otherwise indicated.
- D. Automatic Drain Valves: Stainless-steel body and internal parts, rated for 200-psig minimum working pressure, capable of automatic discharge of collected condensate.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Low-Pressure Compressed-Air Distribution Piping: Use the following piping materials for each size range:
 - 1. NPS 2 and Smaller: Steel pipe; threaded, malleable-iron fittings; and threaded joints.

3.2 VALVE APPLICATIONS

- A. Equipment Isolation Valves: Safety-exhaust, copper-alloy ball valve with exhaust vent and pressure rating at least as great as piping system operating pressure.

3.3 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of compressed-air piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, air-compressor sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. 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 otherwise indicated.
- C. Install piping adjacent to equipment and machines to allow service and maintenance.
- D. Install air and drain piping with 1 percent slope downward in direction of flow.
- E. Install nipples, flanges, unions, transition and special fittings, and valves with pressure ratings same as or higher than system pressure rating, unless otherwise indicated.
- F. Equipment and Specialty Flanged Connections:
 - 1. Use steel companion flange with gasket for connection to steel pipe.
- G. Install branch connections to compressed-air mains from top of main. Provide drain leg and drain trap at end of each main and branch and at low points.
- H. Install thermometer and pressure gage on discharge piping from each air compressor and on each receiver.
- I. Install piping to permit valve servicing.
- J. Install piping free of sags and bends.
- K. Install fittings for changes in direction and branch connections.
- L. Install seismic restraints on piping. Seismic-restraint devices are specified in Section 210548 "Vibration and Seismic Controls for Fire Suppression Piping and Equipment."
- M. Install unions, adjacent to each valve and at final connection to each piece of equipment and machine.

3.4 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from pipe and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Apply appropriate tape or thread compound to external pipe threads.
- D. Brazed Joints for Copper Tubing: Join according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

- E. Flanged Joints: Use asbestos-free, nonmetallic gasket suitable for compressed air. Join flanges with gasket and bolts according to ASME B31.9 for bolting procedure.
- F. Dissimilar Metal Piping Material Joints: Use dielectric fittings.

3.5 VALVE INSTALLATION

- A. Install shutoff valves and unions or flanged joints at compressed-air piping to air compressors.
- B. Install shutoff valve at inlet to each automatic drain valve, filter, lubricator, and pressure regulator.
- C. Install check valves to maintain correct direction of compressed-air flow to and from compressed-air piping specialties and equipment.

3.6 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric unions in piping at connections of dissimilar metal piping and tubing.

3.7 FLEXIBLE PIPE CONNECTOR INSTALLATION

- A. Install flexible pipe connectors in discharge piping of each air compressor.
- B. Install stainless-steel-hose flexible pipe connectors in steel compressed-air piping.

3.8 SPECIALTY INSTALLATION

- A. Install safety valves on receivers in quantity and size to relieve at least the capacity of connected air compressors.
- B. Install air-main pressure regulators in compressed-air piping at or near air compressors.
- C. Install air-line pressure regulators in branch piping to equipment.
- D. Install automatic drain valves on aftercoolers, receivers, and dryers. Discharge condensate onto nearest floor drain.

3.9 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements in Section 210548 "Vibration and Seismic Controls for Fire Suppression Piping and Equipment" for seismic-restraint devices.
- B. Individual, Straight, Horizontal Piping Runs:
 - 1. 100 Feet or Less: MSS Type 1, adjustable, steel clevis hangers.
- C. Base of Vertical Piping: MSS Type 52, spring hangers.

- D. Support horizontal piping within 12 inches of each fitting and coupling.
- E. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.
- F. Install hangers for Schedule 40, steel piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1/4 to NPS 1/2: 96 inches with 3/8-inch rod.
 - 2. NPS 3/4 to NPS 1-1/4: 84 inches with 3/8-inch rod.
 - 3. NPS 1-1/2: 12 feet with 3/8-inch rod.
 - 4. NPS 2: 13 feet with 3/8-inch rod.
- G. Install supports for vertical, Schedule 40, steel piping every 15 feet.
- H. Install hangers for copper tubing with the following maximum horizontal spacing and minimum

3.10 LABELING AND IDENTIFICATION

- A. Install identifying labels and devices for general-service compressed-air piping, valves, and specialties. Comply with requirements in Section 210553 "Identification for Fire Suppression Piping and Equipment."

3.11 FIELD QUALITY CONTROL

- A. Perform field tests and inspections.
- B. Tests and Inspections:
 - 1. Piping Leak Tests: Test new and modified parts of existing piping. Cap and fill general-service compressed-air piping with oil-free dry air or gaseous nitrogen to pressure of 50 psig above system operating pressure, but not less than 150 psig. Isolate test source and let stand for four hours to equalize temperature. Refill system, if required, to test pressure; hold for two hours with no drop in pressure.
 - 2. Repair leaks and retest until no leaks exist.

END OF SECTION 221513

SECTION 221519 - GENERAL-SERVICE PACKAGED AIR COMPRESSORS AND RECEIVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Oil Lubricated air compressors.

1.2 DEFINITIONS

- A. Actual Air: Air delivered from air compressors. Flow rate is delivered compressed air measured in acfm.
- B. Standard Air: Free air at 68 deg F and 1 atmosphere before compression or expansion and measured in scfm.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. 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.
- B. ASME Compliance: Fabricate and label receivers to comply with ASME Boiler and Pressure Vessel Code.

2.2 GENERAL REQUIREMENTS FOR PACKAGED AIR COMPRESSORS AND RECEIVERS

- A. General Description: Factory-assembled, -wired, -piped, and -tested; electric-motor-driven; air-cooled; continuous-duty air compressors and receivers that deliver air of quality equal to intake air.

2.3 OIL LUBRICATED AIR COMPRESSORS

- A. Manufacturers: Provide a product by one of the following manufacturers:
1. General Air Products
 2. Air Power Products Limited
 3. Jenny Products, Inc.
- B. Equipment Specifications
1. Compressor shall conform to NFPA 13 standards and have a capacity for restoring normal air pressure in the system within 30 minutes.
 2. Tank Mounted Oil Lubricated Unit
 3. ASME / NB Air Receiver
 4. NEMA Rated / UL Listed Motor
 5. UL Listed Pressure Switch
 6. ASME Safety Valve
 7. Air Pressure Gauge
 8. Industrial Duty Compressor Pump
 9. OSHA Enclosed Belt Guard
 10. Manual Tank Drain
 11. Specially formulated compressor oil (shipped loose)

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

- A. Equipment Mounting:
1. Install air compressors on cast-in-place concrete equipment base.
 2. Comply with requirements for vibration isolation and seismic control devices specified in Section 210548 "Vibration and Seismic Controls for Plumbing Piping and Equipment"
- B. Install compressed-air equipment anchored to substrate.
- C. Arrange equipment so controls and devices are accessible for servicing.
- D. Maintain manufacturer's recommended clearances for service and maintenance.
- E. Install the following devices on compressed-air equipment:
1. Thermometer, Pressure Gage, and Safety Valve: Install on each compressed-air receiver.
 2. Pressure Regulators: Install downstream from air compressors and dryers.

3. Automatic Drain Valves: Install on aftercoolers, receivers, and dryers. Discharge condensate over nearest floor drain.

3.2 CONNECTIONS

- A. Comply with requirements for piping specified in Section 221513 "General-Service Compressed-Air Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to machine, allow space for service and maintenance.

3.3 IDENTIFICATION

- A. Identify general-service air compressors and components. Comply with requirements for identification specified in Section 210553 "Identification for Fire Suppression Piping and Equipment."

3.4 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain air compressors

END OF SECTION 221519

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SECTION 223300 - 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. Section Includes:
 - 1. Commercial, electric, storage, domestic-water heaters.
 - 2. Flow-control, electric, tankless, domestic-water heaters.
 - 3. Domestic-water heater accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings:
 - 1. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Equipment room drawing or BIM model, drawn to scale, on which the items described in this Section are shown and coordinated with all building trades.

1.5 Retain "Seismic Qualification Data" Paragraph below if required by seismic criteria applicable to Project. Coordinate with Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment." See ASCE/SEI 7 for certification requirements for equipment and components.

- A. Seismic Qualification Data: Certificates, for commercial domestic-water heaters, accessories, and components, 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.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- B. Product Certificates: For each type of [commercial] [residential] [and] [tankless], electric, domestic-water heater.
- C. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.
- D. Source quality-control reports.
- E. Field quality-control reports.
- F. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For electric, domestic-water heaters to include emergency, operation, and maintenance manuals.

1.7 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of electric, domestic-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 Periods: From date of Substantial Completion.
 - a. Commercial, Electric, Storage, Domestic-Water Heaters:
 - 1) Storage Tank: Three years.
 - 2) Controls and Other Components: Three years.
 - b. Electric, Tankless, Domestic-Water Heaters: Five year(s).
 - c. Expansion Tanks: Five years.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.
- B. Seismic Performance: Commercial, electric, domestic-water heaters shall withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7
 - 1. 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"
- C. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1.
- D. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- E. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 and NSF 372.

2.2 COMMERCIAL, ELECTRIC, DOMESTIC-WATER HEATERS

1.

- B. Commercial, Electric, Storage, Domestic-Water Heaters:
 - 1. Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.
 - 2. Standard: UL 1453.
 - 3. Storage-Tank Construction: ASME-code, 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 in accordance with ASME B1.20.1.
 - 2) NPS 2-1/2 and Larger: Flanged ends in accordance with ASME B16.5 for steel and stainless steel flanges, and in accordance with ASME B16.24 for copper and copper-alloy flanges.
 - b. Pressure Rating: 150 psig
 - c. Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending lining material into tappings.
 - 4. Factory-Installed, Storage-Tank Appurtenances:
 - a. Anode Rod: Replaceable magnesium.
 - b. Drain Valve: Corrosion-resistant metal with hose-end connection.
 - c. Insulation: Comply with ASHRAE/IES 90.1.
 - d. Jacket: Steel with enameled finish or high-impact composite material.

- e. Heating Elements: Electric, screw-in or bolt-on immersion type arranged in multiples of three.
 - 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 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 working-pressure rating of domestic-water heater. Select one relief valve with sensing element that extends into storage tank.
5. Special Requirements: NSF 5 construction.

2.3 ELECTRIC, TANKLESS, DOMESTIC-WATER HEATERS

- A. Flow-Control, Electric, Tankless, Domestic-Water Heaters:
- 1. Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.
 - 2. Standard: UL 499 for electric, tankless, (domestic-water-heater) heating appliance.
 - 3. Construction: Copper piping or tubing complying with NSF 61 and NSF 372 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.
 - 4. Support: Bracket for wall mounting.
 - 5. Capacity and Characteristics:
 - a. Flow Rate: see drawing schedule
 - b. Maximum Temperature Setting: 110 deg F.
 - c. Power Demand: see drawing schedule
 - d. Electrical Characteristics:
 - 1) Volts: 208> V.
 - 2) Phases: Single
 - 3) Hertz: 60 Hz.
 - 4) Full-Load Amperes: see equipment specs and electrical drawings
 - 5) Minimum Circuit Ampacity: see equipment specs and electrical drawings
 - 6) Maximum Overcurrent Protection: see equipment specs and electrical drawings

2.4 DOMESTIC-WATER HEATER ACCESSORIES

- A. Domestic-Water Expansion Tanks:
- 1. Source Limitations: Obtain domestic-water expansion tanks from single source from single manufacturer.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

2. Description: Steel pressure-rated tank constructed with welded joints and factory-installed, butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
 3. Construction:
 - a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
 - b. Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
 - c. Air-Charging Valve: Factory installed.
 4. Capacity and Characteristics:
 - a. Working-Pressure Rating: 150 psig
 - b. Capacity Acceptable: see drawing schedules
 - c. Air Precharge Pressure: see equipment specifications, drawing schedule.
- B. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 with ASME B1.20.1 pipe threads.
- C. Piping-Type Heat Traps: Field-fabricated piping arrangement in accordance with ASHRAE/IES 90.1 and ASHRAE 90.2
- D. Heat-Trap Fittings: ASHRAE/IES 90.1 and ASHRAE 90.2.
- E. Combination Temperature-and-Pressure Relief Valves: ASME rated and stamped. Include relieving capacity at least as great as heat input, and include pressure setting less than working-pressure rating of domestic-water heater. Select relief valves with sensing element that extends into storage tank.
- F. Pressure Relief Valves: ASME rated and stamped. Include pressure setting less than working-pressure rating of domestic-water heater.
- G. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4.
- H. Shock Absorbers: ASSE 1010 or PDI-WH 201, Size A water hammer arrester.
- I. Domestic-Water Heater Stands: Manufacturer's factory-fabricated steel stand for floor mounting, capable of supporting domestic-water heater and water. Include dimension that will support bottom of domestic-water heater a minimum of 4 inches above the floor on housekeeping pad.
- 2.5 SOURCE QUALITY CONTROL
- A. Factory Tests: Test and inspect domestic-water heaters specified to be ASME-code construction, in accordance with ASME Boiler and Pressure Vessel Code.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- B. Hydrostatically test commercial domestic-water heaters to minimum of one and one-half times pressure rating before shipment.
- C. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

- A. Commercial, Electric, Domestic-Water Heater Mounting: Install commercial, electric, domestic-water heaters on concrete base. Comply with requirements for concrete bases specified in Section 033000 "Cast-in-Place Concrete."
 - 1. Exception: Omit concrete bases for commercial, electric, domestic-water heaters if installation on stand, bracket, suspended platform, or directly on floor is indicated.
 - 2. Maintain manufacturer's recommended clearances.
 - 3. Arrange units so controls and devices that require servicing are accessible.
 - 4. 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.
 - 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 - 6. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 7. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 8. Anchor domestic-water heaters to substrate.
- B. Electric, Tankless, Domestic-Water Heater Mounting: Install electric, tankless, domestic-water heaters at least 18 inches above floor on wall bracket.
 - 1. Maintain manufacturer's recommended clearances.
 - 2. Arrange units so controls and devices that require servicing are accessible.
 - 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.
 - 5. Anchor domestic-water heaters to substrate.
- C. Install electric, domestic-water heaters level and plumb, in accordance with layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
 - 1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- D. Install commercial, electric, domestic-water heaters with seismic-restraint devices. Comply with requirements for seismic-restraint devices specified in Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment."
- E. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend domestic-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.
- F. Install combination temperature-and-pressure relief valves in water piping for electric, domestic-water heaters without storage. Extend domestic-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.
- G. 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 electric, domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."
- H. Install thermometers on outlet piping of electric, domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."
- I. Install thermometers on inlet and outlet piping of residential, solar, electric, domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."
- J. Assemble and install inlet and outlet piping manifold kits for multiple electric, domestic-water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each electric, domestic-water heater. Include shutoff valve and thermometer in each domestic-water heater inlet and outlet, and throttling valve in each electric, domestic-water heater outlet. Comply with requirements for valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping," and comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."
- K. Install piping-type heat traps on inlet and outlet piping of electric, domestic-water heater storage tanks without integral or fitting-type heat traps.
- L. Fill electric, domestic-water heaters with water.
- M. Charge domestic-water expansion tanks with air to required system pressure.
- N. Install dielectric fittings in all locations where piping of dissimilar metals is to be joined. The wetted surface of the dielectric fitting contacted by potable water shall contain less than 0.25 percent of lead by weight.

3.2 PIPING CONNECTIONS

- A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to electric, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- D. Perform tests and inspections with the assistance of a factory-authorized service representative.
- E. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- F. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections.
- G. Prepare test and inspection reports.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial and tankless, electric, domestic-water heaters. Training shall be a minimum of one hour(s).

END OF SECTION 223300

SECTION 224213.13 - COMMERCIAL WATER CLOSETS

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 closets.
 - 2. Flushometer valves and tanks.
 - 3. Toilet seats.
 - 4. Supports.

1.3 DEFINITIONS

- A. Effective Flush Volume: 1.28 gpf per fixture.
- B. Remote Water Closet: Located more than 30 feet from other drain line connections or fixture and where less than 1.5 drainage fixture units are upstream of the drain line connection.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for water closets.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flushometer valves and electronic sensors to include in operation and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Flushometer-Valve Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than one of each type.

PART 2 - PRODUCTS

2.1 WALL-MOUNTED WATER CLOSETS

- A. Water Closets : PF-1 - Wall mounted, top spud, accessible. – Sloan ST-2459
 - 1. Bowl:
 - a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
 - b. Material: Vitreous china.
 - c. Type: Siphon jet.
 - d. Style: Flushometer valve.
 - e. Height: Standard.
 - f. Rim Contour: Elongated.
 - g. Water Consumption: 1.28 gal. per flush.
 - h. Spud Size and Location: NPS 1-1/2; top.
 - 2. Flushometer Valve: Sloan 111 SFSM-1.28
 - 3. Toilet Seat: Bemis or Church, confirm with Architect
 - 4. Support: see drawing schedule
 - 5. Water-Closet Mounting Height: Standard or Handicapped/elderly according to ICC/ANSI A117.1.
 - 6.

2.2 FLUSHOMETER VALVES

- A. Solenoid-Actuator, Diaphragm Flushometer Valves - PF-12 - Sloan 111 SFSM-1.28 :
 - 1. Standard: ASSE 1037.
 - 2. Minimum Pressure Rating: 125 psig.
 - 3. Features: Include integral check stop and backflow-prevention device.
 - 4. Material: Brass body with corrosion-resistant components.
 - 5. Exposed Flushometer-Valve Finish: Chrome plated.
 - 6. Style: Exposed.
 - 7. Actuator: Solenoid complying with UL 1951, and listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 8. Trip Mechanism: Battery-powered electronic sensor complying with UL 1951, and listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 9. Consumption: 1.28 gal per flush.
 - 10. Minimum Inlet: NPS 1.

11. Minimum Outlet: NPS 1-1/4.
- 12.

2.3 TOILET SEATS

- A. Toilet Seats: see drawings schedules
 1. Standard: IAPMO/ANSI Z124.5.
 2. Material: Plastic.
 3. Type: Commercial Heavy duty
 4. Shape: Elongated rim, open front.
 5. Hinge: Self-sustaining, check
 6. Hinge Material: Noncorroding metal.
 7. Seat Cover: Not required.
 8. Color: White

2.4 SUPPORTS

- A. Water Closet Carrier:
 1. Standard: ASME A112.6.1M.
 2. Description: Waste-fitting assembly, as required to match drainage piping material and arrangement with faceplates, couplings gaskets, and feet; bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.

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 water-closet installation.
- B. Examine walls and floors for suitable conditions where water closets will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Water-Closet Installation:
 1. Install level and plumb according to roughing-in drawings.
 2. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.
- B. Support Installation:

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

1. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
2. Use carrier supports with waste-fitting assembly and seal.
3. Install floor-mounted, back-outlet water closets attached to building floor substrate, onto waste-fitting seals; and attach to support.
4. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals; and affix to building substrate.

C. Flushometer-Valve Installation:

1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
3. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.
4. Install actuators in locations that are easy for people with disabilities to reach.
5. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

D. Install toilet seats on water closets.

E. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.
3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

F. Joint Sealing:

1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to water-closet color.
3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

- A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."
- D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.4 ADJUSTING

- A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

- B. Adjust water pressure at flushometer valves to produce proper flow.
- C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

- A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.
- B. Install protective covering for installed water closets and fittings.
- C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213.13

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SECTION 224216.13 - COMMERCIAL LAVATORIES

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. Lavatories.
- 2. Faucets.
- 3. Supply fittings.
- 4. Waste fittings.
- 5. Supports.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for lavatories.
- 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

- B. Shop Drawings: Include diagrams for power, signal, and control wiring of automatic faucets.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For lavatories and faucets to include in operation and maintenance manuals.

- 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

- a. Servicing and adjustments of automatic faucets.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
 2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

PART 2 - PRODUCTS

2.1 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES

- A. Lavatory PF-3, PF-4: Slab type, vitreous china, wall mounted.
1. Duravit 2350500030
 2. Fixture:
 - a. Standard: ASME A112.19.2/CSA B45.1.
 - b. Type: For wall hanging.
 - c. Nominal Size: Rectangular, 19-5/8" by 18-1/2" inches
 - d. Faucet-Hole Punching: One hole
 - e. Faucet-Hole Location: Top.
 - f. Color: White
 - g. Mounting Material: Chair carrier.
 3. Support: concealed-arm lavatory carrier
 4. Lavatory Mounting Height: Standard, Child, Handicapped/elderly according to ICC A117.1 – refer to architectural drawings.

2.2 AUTOMATICALLY OPERATED LAVATORY FAUCETS

- A. NSF Standard: Comply with NSF 372 for faucet materials that will be in contact with potable water.
- B. Lavatory Faucets PF-7: Automatic-type, battery-powered, electronic-sensor-operated, with mixing valve 605XTMV1070.
1. American Standard 702B.103, power kit PK00.WRK
 2. Mixing valve: American Standard 605XTMV1070
 3. Standards: ASME A112.18.1/CSA B125.1 and UL 1951.
 4. 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.
 5. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
 6. Body Type: Single hole

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

7. Body Material: Commercial, solid brass.
8. Finish: Polished chrome.
9. Maximum Flow Rate: 0.35 gpm
10. Mounting Type: Deck, concealed
11. Spout: Rigid type.
12. Spout Outlet: Laminar Spray
13. Drain: Not part of faucet

2.3 LAMINAR-FLOW, FAUCET-SPOUT OUTLETS

- A. NSF Standard: Comply with NSF 372 for faucet-spout-outlet materials that will be in contact with potable water.
- B. Description: Chrome-plated-brass, faucet-spout outlet that produces non-aerating, laminar stream. Include external or internal thread that mates with faucet outlet for attachment to faucets where indicated and flow-rate range that includes flow of faucet.

2.4 SUPPLY FITTINGS

- A. NSF Standard: Comply with NSF 372 for supply-fitting materials that will be in contact with potable water.
- B. Standard: ASME A112.18.1/CSA B125.1.
- C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.
- D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.
- E. Operation: Loose key.
- F. Risers:
 1. NPS 1/2.
 2. Chrome-plated, rigid-copper-pipe and brass straight or offset tailpieces ASME A112.18.6, braided- or corrugated-stainless-steel, flexible hose riser.

2.5 WASTE FITTINGS

- A. Standard: ASME A112.18.2/CSA B125.2.
- B. Drain: Grid type with NPS 1-1/2 offset and straight tailpiece.
- C. Trap:
 1. Size: NPS 1-1/2 by NPS 1-1/4
 2. Material: Chrome-plated, two-piece, cast-brass trap and ground-joint swivel elbow with 0.032-inch- thick brass tube to wall and chrome-plated, brass or steel wall flange.

2.6 SUPPORTS

- A. Lavatory Carrier:
 - 1. Standard: ASME A112.6.1M.

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 lavatory installation.
- B. Examine counters and walls for suitable conditions where lavatories will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install lavatories level and plumb according to roughing-in drawings.
- B. Install supports, affixed to building substrate, for wall-mounted lavatories.
- C. Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, according to ICC/ANSI A117.1.
- D. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- E. Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."
- F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.3 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

3.4 ADJUSTING

- A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.
- C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

- A. After completing installation of lavatories, inspect and repair damaged finishes.
- B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed lavatories and fittings.
- D. Do not allow use of lavatories for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.13

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SECTION 224216.16 - COMMERCIAL SINKS

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. Service sinks.
 2. Sink faucets.
 3. Supports.
 4. Supply fittings.
 5. Waste fittings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for sinks.
 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sinks to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
 2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

PART 2 - PRODUCTS

2.1 SERVICE SINKS

- A. Service Sinks PF-5: Precast Terrazo, floor mounted.
 - 1. Fixture: Acorn Terrazo-ware TSH-24-KFC
 - a. Standard: ASME A112.19.1/CSA B45.2.
 - b. Type: Floor mount service sink with 12" sides
 - c. Nominal Size: 24 by 24 inches.
 - d. Color: By architect
 - e. Mounting: NPS 3 P-trap standard with grid strainer inlet, cleanout, and floor flange.
 - f. Rim Guard: On front and sides.
 - 2. Faucet: American Standard 8344.212
 - 3. Support: Floor Mount
- B. Pantry Sinks PF-1: Stainless Steel free standing
 - 1. Fixture: ELKAY LR2522SC
 - a. Standard: ASME A112.19.3/CSA B45.4.
 - b. Type: Drop-in sink.
 - c. Back: Three faucet holes
 - d. Nominal Size: 25 by 22 inches
 - e. Color: Stainless Steel
 - f. Mounting: NPS 2 P-trap standard with grid strainer
 - 2. Faucet: Elkay LK810GN04T4SC
 - 3. Support: Countertop mounted.

2.2 SINK FAUCETS

- A. NSF Standard: Comply with NSF 372 for faucet-spout materials that will be in contact with potable water.
- B. Sink Faucets: Manual type, two lever handle mixing valve.
 - 1. Commercial, Cast-Brass Faucets PF-14: American Standard 8344.212
 - 2. A112.18.1/CSA B125.1.
 - 3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
 - 4. Body Type: Widespread
 - 5. Body Material: Commercial, solid brass
 - 6. Finish: rough Chrome plated
 - 7. Handle(s): Wrist blade
 - 8. Mounting Type: Back/wall, exposed
 - 9. Spout Type: Rigid, solid brass with wall brace

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

10. Vacuum Breaker: Required
11. Spout Outlet: Hose thread according to ASME B1.20.7

C.

2.3 SUPPLY FITTINGS

- A. NSF Standard: Comply with NSF 372 for supply-fitting materials that will be in contact with potable water.
- B. Standard: ASME A112.18.1/CSA B125.1.
- C. Supply Piping: Chrome-plated brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated brass or stainless-steel wall flange.
- D. Supply Stops: Chrome-plated brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.
- E. Operation: Loose key
- F. Risers:
 1. NPS 1/2.
 2. Chrome-plated, rigid-copper pipe.

2.4 WASTE FITTINGS

- A. Standard: ASME A112.18.2/CSA B125.2.
- B. Drain: Grid type with NPS 1-1/2 offset and straight tailpiece.
- C. Trap:
 1. Size: NPS 3.
 2. Material: Chrome-plated, two-piece, cast-brass trap and ground-joint swivel elbow with brass tube to wall and chrome-plated brass or steel wall flange.

2.5 GROUT

- A. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

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 sink installation.
- B. Examine walls, floors, and counters for suitable conditions where sinks will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install sinks level and plumb according to roughing-in drawings.
- B. Install supports, affixed to building substrate, for wall-hung sinks.
- C. Install accessible wall-mounted sinks at handicapped/elderly mounting height according to ICC/ANSI A117.1.
- D. Set floor-mounted sinks in leveling bed of cement grout.
- E. Install water-supply piping with stop on each supply to each sink faucet.
 - 1. Exception: Use ball or gate valves if supply stops are not specified with sink. Comply with valve requirements specified in Section 220523.12 "Ball Valves for Plumbing Piping" and Section 220523.15 "Gate Valves for Plumbing Piping."
 - 2. Install stops in locations where they can be easily reached for operation.
- F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- G. Seal joints between sinks and counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."
- H. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.3 CONNECTIONS

- A. Connect sinks with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

CONTRACT No. 22-523
DIVISION 22 - PLUMBING

3.4 ADJUSTING

- A. Operate and adjust sinks and controls. Replace damaged and malfunctioning sinks, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

- A. After completing installation of sinks, inspect and repair damaged finishes.
- B. Clean sinks, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed sinks and fittings.
- D. Do not allow use of sinks for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.16

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SECTION 230500 – COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The requirements of this Section apply to all sections of Division 23.
- B. Definitions:
 - 1. “Concealed”: Piping, ductwork, and equipment concealed from view and protected from physical contact by building occupants.
 - 2. “Exposed”: Piping, ductwork, and equipment exposed to view in finished rooms.
 - 3. “Finished”: 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.
 - 4. “Furnish”: purchase and supply all materials, labor, equipment, testing apparatus, controls, tests, accessories and all other items customarily required for the proper and complete application for the particular work referred to.
 - 5. “Install”: join, unite, fasten, link, attach, set up or otherwise connect together before testing and turning over to the Owner, complete and ready for regular operation, the particular work referred to.
 - 6. “Option” or “optional”: Contractor's choice of an alternate material or method.
 - 7. “Provide”: Furnish and Install.

1.2 RELATED WORK

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections
 - 1. All sections within Division 23 – Heating, Ventilating, and Air Conditioning.
 - 2. All sections within Division 01 – General Requirements.
 - 3. Relevant sections within Division 21 – Fire Protection
 - 4. Relevant sections within Division 22 – Plumbing
 - 5. Relevant sections within Division 26 – Electrical

1.3 QUALITY ASSURANCE

- A. Mechanical, electrical and associated systems shall be safe, reliable, efficient, durable, easily and safely operable and maintainable, easily and safely accessible, and in compliance with applicable codes as specified. The systems shall be comprised of high quality institutional-class and industrial-class products of manufacturers that are experienced specialists in the required product lines. All construction firms and personnel shall be experienced and qualified specialists in industrial and institutional HVAC.

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

B. Equipment Vibration Tolerance:

1. Refer to Section 23 Section “Vibration and Seismic Controls for HVAC.” Equipment shall be factory-balanced to this tolerance and re-balanced on site, as necessary.
2. After HVAC air balance work is completed and permanent drive sheaves are in place, perform field mechanical balancing and adjustments required to meet the specified vibration tolerance.

C. Products Criteria:

1. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 3 years (or longer as specified elsewhere). The design, model and size of each item shall have been in satisfactory and efficient operation on at least three installations for approximately three years. However, digital electronics devices, software and systems such as controls, instruments, computer work station, shall be the current generation of technology and basic design that has a proven satisfactory service record of at least three years. See other specification sections for any exceptions and/or additional requirements.
2. All items furnished shall be free from defects that would adversely affect the performance, maintainability and appearance of individual components and overall assembly.
3. Conform to codes and standards as required by the specifications. Conform to local codes, if required by local authorities such as the natural gas supplier, if the local codes are more stringent than those specified. Refer any conflicts to the Engineer.
4. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.
5. Assembled Units: Manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.
6. Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.
7. Asbestos products or equipment or materials containing asbestos shall not be used.

D. Equipment Service Organizations:

1. HVAC: Products and systems shall be supported by service organizations that maintain a complete inventory of repair parts and are located within 50 miles to the site.

E. HVAC Mechanical Systems Welding: Before any welding is performed, contractor shall submit a certificate certifying that welders comply with the following requirements:

1. Comply with provisions of ASME B31 series "Code for Pressure Piping".
2. Certify that each welder has passed American Welding Society (AWS) qualification tests for the welding processes involved, and that certification is current.

F. Execution (Installation, Construction) Quality:

1. Apply and install all items in accordance with manufacturer's written instructions. Refer conflicts between the manufacturer's instructions and the contract drawings and specifications to the Engineer for resolution.

2. Provide complete layout drawings as required by Paragraph “SUBMITTALS” below. Do not commence construction work on any system until the layout drawings have been approved.

G. Upon request, provide lists of previous installations for selected items of equipment. Include contact persons who will serve as references, with telephone numbers and e-mail addresses.

1.4 SUBMITTALS

A. Submit in accordance with Division 01, and with requirements in the individual specification sections.

B. Contractor shall make all necessary field measurements and investigations to assure that the equipment and assemblies will meet contract requirements.

C. If equipment is submitted which differs in arrangement from that shown, provide drawings that show the rearrangement of all associated systems. Approval will be given only if all features of the equipment and associated systems, including accessibility, are equivalent to that required by the contract.

D. Prior to submitting shop drawings for approval, contractor shall certify in writing that manufacturers of all major items of equipment have each reviewed drawings and specifications, and have jointly coordinated and properly integrated their equipment and controls to provide a complete and efficient installation.

E. Submittals and shop drawings for interdependent items, containing applicable descriptive information, shall be furnished together and complete in a group. Coordinate and properly integrate materials and equipment in each group to provide a completely compatible and efficient.

F. Manufacturer's Literature and Data: Submit under the pertinent section rather than under this section.

1. Submit belt drive with the driven equipment. Submit selection data for specific drives when requested by the Engineer.

2. Submit electric motor data and variable speed drive data with the driven equipment.

3. Equipment and materials identification.

4. Fire-stopping materials.

5. Hangers, inserts, supports and bracing. Provide load calculations for variable spring and constant support hangers.

6. Wall, floor, and ceiling plates.

G. HVAC Maintenance Data and Operating Instructions:

1. Maintenance and operating manuals in accordance with Division 01, for systems and equipment.

2. Provide a listing of recommended replacement parts for keeping in stock supply, including sources of supply, for equipment. Include in the listing belts for equipment: Belt manufacturer, model number, size and style, and distinguished whether of multiple belt sets.

- H. Provide copies of approved HVAC equipment submittals to the Testing, Adjusting and Balancing Subcontractor.

1.5 COORDINATION DRAWINGS

- A. Coordinate all new work with existing structure and with existing work which is to remain. Note all existing conditions which may interfere with new work as shown on the documents of this trade and of all other trades which are part of this project. In form the Architect and Engineers of all such conditions in writing with sufficient time to address the conflicts so as not to affect project schedule.
- B. Prepare a complete set of construction Coordination Drawings indicating the equipment actually purchased and the exact routing for all lines such as piping, busway, conduit, ductwork, etc., including conduit embedded in concrete. Use the sheetmetal shop drawings as the base drawings to which all other contractors will add their work.
- C. Color Coordinated drawings (with different color per trade) shall be provided for all areas with acceptance sign off from all trades required at time of shop drawing submittals, including, but not limited to:
 - 1. Plumbing Contractor
 - 2. Electrical Contractor
 - 3. General Contractor
 - 4. Testing Adjusting and Balancing Contractor
 - 5. Controls Contractor
 - 6. Fire Sprinkler Contractor
- D. Drawings shall indicate coordination with work in other Divisions which must be incorporated in mechanical spaces, including, but not limited to:
 - 1. Irrigation Equipment and Piping.
 - 2. Elevator Equipment.
 - 3. Electrical Equipment.
 - 4. Cable Trays.
 - 5. Architectural features, including doors and partitions
 - 6. IT/Electrical outlets
 - 7. Plumbing equipment
- E. Indicate piping loads and support points for all piping 4" and larger, racked piping, racked conduit, and busway, and submit to the Structural Engineer for review and approval. Indicate the elevation, location, support points, static, dynamic and expansion forces and loads imposed on the structure at support, anchor points, and size of all lines. Indicate all beam penetrations and slab penetrations sized and coordinated. Indicate all work routed underground or embedded in concrete by dimension to column and building lines.
- F. Work installed which interferes with work of any other trade will be corrected at no cost to the project.

1.6 COORDINATION

- A. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces.
- B. 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 that adjoins, shares space with, 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 headroom and clearance may be obtained. In the event that interferences develop, the Owner's Representative'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.
- C. The mechanical drawings show the general arrangement of equipment, ductwork, piping and appurtenances. Follow these drawings as closely as the actual construction and the work of other trades will permit. Provide offsets, fittings, and accessories which may be required but not shown on the drawings. Investigate the site, structural and finish ground conditions affecting the work, and arrange the work accordingly. Provide such work and accessories as may be required to meet such conditions, at no additional cost to the project.
- D. Examine and compare the contract drawings and specifications with the drawings and specifications of other trades, and report any discrepancies between them to the Engineer and obtain from him written instructions for changes necessary in the work. Install and coordinate the work in cooperation with other related trades. Before installation, make proper provisions to avoid interferences.
- E. Wherever the work is of sufficient complexity, prepare additional detail drawings to scale similar to that of the design drawings, prepared on tracing medium of the same size as contract drawings. With these layouts, coordinate the work with the work of other trades. Such detailed work to be clearly identified on the drawings as to the area to which it applies. Submit these drawings to the Engineer for review. At completion include a set of such drawings with each set of as-built drawings.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Protection of Equipment:
 - 1. Equipment and material placed on the job site shall remain in the custody of the Contractor until phased acceptance, whether or not the Owner has reimbursed the Contractor for the equipment and material. The Contractor is solely responsible for the protection of such equipment and material against any damage.
 - 2. Place damaged equipment in first class, new operating condition; or, replace same as determined and directed by the Engineer. Such repair or replacement shall be at no additional cost.
 - 3. Protect interiors of new equipment and piping systems against entry of foreign matter. Clean both inside and outside before painting or placing equipment in operation.

4. Existing equipment and piping being worked on by the Contractor shall be under the custody and responsibility of the Contractor and shall be protected as required for new work.

B. Cleanliness of Piping and Equipment Systems:

1. Exercise care in storage and handling of equipment and piping material to be incorporated in the work. Remove debris arising from cutting, threading and welding of piping.
2. Piping systems shall be flushed, blown or pigged as necessary to deliver clean systems.
3. Clean interior of all tanks prior to delivery
4. Boilers shall be left clean following final internal inspection
5. Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.

1.8 JOB CONDITIONS – WORK IN EXISTING BUILDING

- A. Building Working Environment: Maintain the architectural and structural integrity of the building and the working environment at all times. No storm water or ground water leakage permitted. Provide daily clean up of construction and demolition debris on all floor surfaces and on all equipment.
- B. Acceptance of Work: As new facilities are made available for operation and these facilities are of beneficial use, inspections will be made and tests will be performed. Based on the inspections, a list of contract deficiencies will be issued to the Contractor. After correction of deficiencies as necessary for beneficial use, the Contracting Officer will process necessary acceptance and the equipment will then be under the control and operation of the Owner.

PART 2 - PRODUCTS

2.1 FACTORY-ASSEMBLED PRODUCTS

- A. Provide maximum standardization of components to reduce spare part requirements.
- B. Manufacturers of equipment assemblies that include components made by others shall assume complete responsibility for final assembled unit.
 1. All components of an assembled unit need not be products of same manufacturer.
 2. Constituent parts that are alike shall be products of a single manufacturer.
 3. Components shall be compatible with each other and with the total assembly for intended service.
 4. Contractor shall guarantee performance of assemblies of components, and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.
- C. Components of equipment shall bear manufacturer's name and trademark, model number, serial number and performance data on a name plate securely affixed in a conspicuous place, or cast

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

integral with, stamped or otherwise permanently marked upon the components of the equipment.

- D. Major items of equipment, which serve the same function, must be the same make and model. Exceptions will be permitted if performance requirements cannot be met.

2.2 COMPATIBILITY OF RELATED EQUIPMENT

Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that the result will be a complete and fully operational plant that conforms to contract requirements.

2.3 WALL, FLOOR AND CEILING PLATES

- A. Material and Type: Chrome plated brass or chrome plated steel, one piece or split type with concealed hinge, with set screw for fastening to pipe, or sleeve. Use plates that fit tight around pipes, cover openings around pipes and cover the entire pipe sleeve projection.
- B. Thickness: Not less than 3/32 inch for floor plates. For wall and ceiling plates, not less than 0.025-inch for up to 3 inch pipe, 0.035-inch for larger pipe.
- C. Locations: Use where pipe penetrates floors, walls and ceilings in exposed locations, in finished areas only. Provide a watertight joint in spaces where brass or steel pipe sleeves are specified.

PART 3 - EXECUTION

3.1 ARRANGEMENT AND INSTALLATION OF EQUIPMENT AND PIPING

- A. Coordinate location of piping, sleeves, inserts, hangers, ductwork and equipment. Locate piping, sleeves, inserts, hangers, ductwork and equipment clear of windows, doors, openings, light outlets, and other services and utilities. Prepare equipment layout drawings to coordinate proper location and personnel access of all facilities. Submit the drawings for review as required by Part 1. Follow manufacturer's published recommendations for installation methods not otherwise specified.
- B. Operating Personnel Access and Observation Provisions: Select and arrange all equipment and systems to provide clear view and easy access, without use of portable ladders, for maintenance and operation of all devices including, but not limited to: all equipment items, valves, filters, strainers, transmitters, sensors, control devices. All gages and indicators shall be clearly visible by personnel standing on the floor or on permanent platforms. Do not reduce or change maintenance and operating space and access provisions that are shown on the drawings.
- C. Equipment and Piping Support: Coordinate structural systems necessary for pipe and equipment support with pipe and equipment locations to permit proper installation.
- D. Location of pipe sleeves, trenches and chases shall be accurately coordinated with equipment and piping locations.

E. Cutting Holes:

1. Cut holes through concrete and masonry by rotary core drill. Pneumatic hammer, impact electric, and hand or manual hammer type drill will not be allowed, except as permitted by Owner where working area space is limited.
2. Locate holes to avoid interference with structural members such as beams or grade beams. Holes shall be laid out in advance and drilling done only after approval by Owner. If the Contractor considers it necessary to drill through structural members, this matter shall be referred to Owner for approval.
3. Do not penetrate membrane waterproofing.

F. Protection and Cleaning:

1. Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation, in accordance with the manufacturer's recommendations and as approved by the Owner. Damaged or defective items in the opinion of the Owner, shall be replaced.
2. Protect all finished parts of equipment, such as shafts and bearings where accessible, from rust prior to operation by means of protective grease coating and wrapping. Close pipe openings with caps or plugs during installation. Tightly cover and protect fixtures and equipment against dirt, water chemical, or mechanical injury. At completion of all work thoroughly clean fixtures, exposed materials and equipment.

G. Inaccessible Equipment:

1. Where the Owner determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled or remedial action performed as directed at no additional cost.
2. The term "conveniently accessible" is defined as capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, fans, pumps, belt guards, transformers, high voltage lines, piping, and ductwork.

3.2 RIGGING

- A. Design is based on application of available equipment. Openings in building structures are planned to accommodate design scheme.
- B. Close all openings in the building when not required for rigging operations to maintain proper environment in the facility for operation and maintenance of service.
- C. Contractor shall provide all facilities required to deliver specified equipment and place on foundations. Attachments to structures for rigging purposes and support of equipment on structures shall be Contractor's full responsibility. Upon request, the Owner will check structure adequacy and advise Contractor of recommended restrictions.

3.3 MECHANICAL DEMOLITION

- A. Rigging access, other than indicated on the drawings, shall be provided by the Contractor after approval for structural integrity by the Owner. Such access shall be provided without additional cost or time.
- B. Completely remove all piping, wiring, conduit, and other devices associated with the equipment not to be re-used in the new work. This includes all pipe, valves, fittings, insulation, and all hangers including the top connection and any fastenings to building structural systems. Seal all openings, after removal of equipment, pipes, ducts, and other penetrations in roof, walls, floors, in an approved manner and in accordance with plans and specifications where specifically covered. Structural integrity of the building system shall be maintained. Reference shall also be made to the drawings and specifications of the other disciplines in the project for additional facilities to be demolished or handled.

3.4 CLEANING AND PAINTING

- A. Prior to final inspection and acceptance of the plant and facilities for beneficial use, the plant facilities, equipment and systems shall be thoroughly cleaned and painted.
- B. In addition, the following special conditions apply:
 - 1. Cleaning shall be thorough. Use solvents, cleaning materials and methods recommended by the manufacturers for the specific tasks. Remove all rust prior to painting and from surfaces to remain unpainted. Repair scratches, scuffs, and abrasions prior to applying prime and finish coats.
 - 2. Material And Equipment Not To Be Painted Includes:
 - a. Motors, controllers, control switches, and safety switches.
 - b. Control and interlock devices.
 - c. Regulators.
 - d. Pressure reducing valves.
 - e. Control valves and thermostatic elements.
 - f. Lubrication devices and grease fittings.
 - g. Copper, brass, aluminum, stainless steel and bronze surfaces.
 - h. Valve stems and rotating shafts.
 - i. Pressure gauges and thermometers.
 - j. Glass.
 - k. Name plates.
 - 3. Control and instrument panels shall be cleaned, damaged surfaces repaired, and shall be touched-up with matching paint obtained from panel manufacturer.
 - 4. Pumps, motors, steel and cast iron bases, and coupling guards shall be cleaned, and shall be touched-up with the same color as utilized by the pump manufacturer
 - 5. Temporary Facilities: Apply paint to surfaces that do not have existing finish coats.
 - 6. Paint shall withstand the following temperatures without peeling or discoloration:
 - a. Condensate and feedwater -- 100 degrees F on insulation jacket surface and 250 degrees F on metal pipe surface.
 - b. Steam -- 125 degrees F on insulation jacket surface and 375 degrees F on metal pipe surface.
 - 7. Final result shall be smooth, even-colored, even-textured factory finish on all items. Completely repaint the entire piece of equipment if necessary to achieve this.

3.5 LUBRICATION

- A. Lubricate all devices requiring lubrication prior to initial operation. Field-check all devices for proper lubrication.
- B. Equip all devices with required lubrication fittings or devices. Provide a minimum of one quart of oil and one pound of grease of manufacturer's recommended grade and type for each different application; also provide 12 grease sticks for lubricated plug valves. Deliver all materials to Owner in unopened containers that are properly identified as to application.
- C. Provide a separate grease gun with attachments for applicable fittings for each type of grease applied.
- D. All lubrication points shall be accessible without disassembling equipment, except to remove access plates.

3.6 STARTUP AND FIELD ADJUSTMENT

- A. Startup Service:
 - 1. Prior to startup, ensure that systems are ready, including checking the following: Proper equipment rotation, proper wiring, auxiliary connections, lubrications, venting fan balance, controls and installed properly set relief and safety valves.
 - 2. Start and operate all systems. Provide services of factory trained technicians for startup of major equipment and systems including boilers, fire pumps, etc.
- B. Contractor shall be responsible to change or adjust belts, drives, pulleys, motors, impellers, as required by balancing company to achieve the desired air and water delivery in an energy efficient manor by all air handling equipment, fans and pumps. Refer to Section 23 05 93.
- C. Start up equipment as described in equipment specifications. Verify that vibration is within specified tolerance prior to extended operation.

3.7 OPERATING AND PERFORMANCE TESTS

- A. Prior to the final inspection, perform required tests as specified in Division 01 and submit the test reports and records to the Engineer.
- B. Should evidence of malfunction in any tested system, or piece of equipment or component part thereof, occur during or as a result of tests, make proper corrections, repairs or replacements, and repeat tests at no additional cost.
- C. When completion of certain work or system occurs at a time when final control settings and adjustments cannot be properly made to make performance tests, then make performance tests for heating systems and for cooling systems respectively during first actual seasonal use of respective systems following completion of work.

3.8 OPERATING INSTRUCTIONS

- A. Each Contractor shall thoroughly instruct the representative(s) of the Owner, to the complete satisfaction of the Architect, in the proper operation of all systems and equipment provided by him. Each Contractor shall make arrangements, via the Prime Contractor as to whom the instructions are to be given in the operation of the basic and auxiliary systems and the periods of time in which they are to be given.
- B. The Architect shall be completely satisfied that the representative of the Owner has been thoroughly and completely instructed in the proper operation of all systems and equipment before final payment is made. If the Architect determines that complete and thorough instructions have not been given by each Contractor to the Owner's representative, then each Contractor shall be directed by the Architect to provide whatever instructions are necessary until the intent of this paragraph of the specification has been complied with. All time required for Owner's instruction to satisfy the above requirements shall be included in this Contract. No extra compensation for such instructions will be allowed.
- C. Provide operating instructions and maintenance data books for all equipment and materials furnished under this Division.
- D. Maintenance instruction manuals to include complete oiling, cleaning, and servicing data compiled in clearly and easily understandable form. Show all model numbers of each piece of equipment, complete lists of replacement parts, motor ratings, and actual loads. Include for each piece of equipment the name, address, e-mail address, and phone number of service personnel.

END OF SECTION 230500

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SECTION 230513 - 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 40 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: Energy efficient, 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: Regreasable, shielded, antifriction 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 motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 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, inductor run.
 - 4. 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.

END OF SECTION 230513

SECTION 230517 - SLEEVES AND SLEEVE SEALS 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. Sleeves.
 - 2. Grout.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

2.2 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
 - 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 - 1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
 - 2. 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.
 - 3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 - 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."
- E. 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 firestopping specified in Section 078413 "Penetration Firestopping."

3.2 SLEEVE SCHEDULE

- A. Use sleeves for the following piping-penetration applications:
 - 1. Concrete Slabs above Grade:
 - a. Galvanized-steel-pipe sleeves.
 - 2. Interior Partitions:
 - a. Galvanized-steel-pipe sleeves.

END OF SECTION 230517

SECTION 230529 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.

B. Related Sections:

1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Section 230548 "Vibration and Seismic Controls for HVAC" for vibration isolation devices.
3. Section 233113 "Metal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

- B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:
 1. Trapeze pipe hangers.
 2. Metal framing systems.
 3. Pipe stands.
 4. Equipment supports.
- C. Delegated-Design Submittal: For trapeze hangers 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. Detail fabrication and assembly of trapeze hangers.
 2. Design Calculations: Calculate requirements for designing trapeze hangers.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

- A. Manufacturer Metal Framing Systems:

1. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
2. Standard: Comply with MFMA-4.
3. Channels: Continuous slotted steel channel with inturned lips.
4. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
6. Coating: Zinc.

2.4 THERMAL-HANGER SHIELD INSERTS

- A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.
- B. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.
- C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 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.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless-steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.6 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-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, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal 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 the building structure.
- B. Metal 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 for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- 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-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
 - 2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.
- G. Install hangers and supports complete with necessary attachments, 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, 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 that 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 to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- N. Insulated Piping:
 - 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 allowed by 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.
 - 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 or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
 - 6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 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.

3.3 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.

3.4 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are 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 carbon-steel pipe hangers and supports, metal trapeze pipe hangers, and metal framing systems and attachments for general service applications.
- F. Use stainless-steel pipe hangers and fiberglass pipe hangers and fiberglass strut systems and stainless-steel or corrosion-resistant attachments for hostile environment applications.
- G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.
- H. Use padded hangers for piping that is subject to scratching.
- I. Use thermal-hanger shield inserts for insulated piping and tubing.
- J. 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 up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
 - 4. 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.

5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
 6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
 11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
 12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
 13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
 14. 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 or carbon-steel plate.
 15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
 17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
 18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
 19. Complete Pipe Rolls (MSS Type 44): 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.
 20. 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.
 21. 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.
- K. 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 24.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- L. 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.
- M. 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.
- N. 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.

- O. 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 allow 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 allow 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 allow 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.
- P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- Q. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- R. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 230529

–NO TEXT ON THIS PAGE–

SECTION 230548 - VIBRATION AND SEISMIC CONTROLS 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.

1.2 SUMMARY

- A. Section Includes:
 - 1. Spring hangers.
 - 2. Mechanical anchor bolts.
 - 3. Restrained isolation roof-curb rails.

1.3 DEFINITIONS

- A. IBC: International Building Code.
- B. ICC-ES: ICC-Evaluation Service.
- C. OSHPD: Office of Statewide Health Planning & Development (for the State of California).

1.4 SUBMITTALS

- A. Product Data: For each type of product.
 - 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 vibration isolation device and seismic-restraint component required.
 - 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. Shop Drawings:
 - 1. Detail fabrication and assembly of equipment bases. Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
- C. Delegated-Design Submittal: For each vibration isolation and seismic-restraint device.
1. Include design calculations and details for selecting vibration isolators, seismic restraints, and vibration isolation bases complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 2. Design Calculations: Calculate static and dynamic loading due to equipment weight, operation, and seismic forces required to select vibration isolators and 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 Sections for equipment mounted outdoors.
 3. 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 was examined for excessive stress and that none exists.
 4. Seismic-Restraint Details:
 - a. Design Analysis: To support selection and arrangement of seismic and wind 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 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).
- D. Coordination Drawings: Show coordination of vibration isolation device installation and seismic bracing for HVAC piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.
- E. Qualification Data: For professional engineer and testing agency.
- F. Welding certificates.
- G. Air-Mounting System Performance Certification: Include natural frequency, load, and damping test data performed by an independent agency.
- H. Field quality-control reports.

- I. Operation and Maintenance Data: For air-spring mounts and restrained-air-spring mounts to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: 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 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 Qualifications: 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 unavailable, 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 PERFORMANCE REQUIREMENTS

- A. Seismic-Restraint Loading:
 - 1. Site Class as Defined in the IBC: E.
 - 2. Assigned Seismic Use Group or Building Category as Defined in the IBC: I.
 - a. Component Importance Factor: 1.25.
 - 3. Design Spectral Response Acceleration at Short Periods (0.2 Second): 0.434.
 - 4. Design Spectral Response Acceleration at 1.0-Second Period: 0.165.
 - 5. Rated strengths, features, and applications 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 four times the maximum seismic forces to which they are subjected.

2.2 SPRING HANGERS

- A. 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. 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.

2.3 MECHANICAL ANCHOR BOLTS

- A. 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.

2.4 RESTRAINED ISOLATION ROOF-CURB RAILS

- A. Description: Factory-assembled, fully enclosed, insulated, air- and watertight curb rail designed to resiliently support equipment and to withstand seismic forces.
- B. Upper Frame: The upper frame shall provide continuous support for equipment and shall be captive to resiliently resist seismic forces.
- C. Lower Support Assembly: The lower support assembly shall be formed sheet metal section containing adjustable and removable steel springs that support the upper frame. The lower support assembly shall have a means for attaching to building structure and a wood nailer for attaching roof materials, and shall be insulated with a minimum of 2 inches (50 mm) of rigid, glass-fiber insulation on inside of assembly. Adjustable, restrained-spring isolators shall be mounted on elastomeric vibration isolation pads and shall have access ports, for level adjustment, with removable waterproof covers at all isolator locations. Isolators shall be located so they are accessible for adjustment at any time during the life of the installation without interfering with the integrity of the roof.
- D. Snubber Bushings: All-directional, elastomeric snubber bushings at least 1/4 inch (6 mm) thick.
- E. Water Seal: Galvanized sheet metal with EPDM seals at corners, attached to upper support frame, extending down past wood nailer of lower support assembly, and counterflashed over roof materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation and seismic and wind-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- 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. Indicate on Drawings, by details, schedules, or a combination of both, the locations where hanger rods for individual pipes and hanger rods for trapeze hangers require hanger-rod stiffeners.
- 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 is adequate to carry present and future static and seismic loads within specified loading limits.

3.3 VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.
- B. Comply with requirements in Section 077200 "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.
- C. Install cables so they do not bend across edges of adjacent equipment or building structure.
- D. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
- E. 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.
- F. 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.
- G. 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 FIELD QUALITY CONTROL

- A. Testing Agency: Engage qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. 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 Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection 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 2 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. Test and adjust restrained-air-spring isolator controls and safeties.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Prepare test and inspection reports.

3.5 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.

END OF SECTION 230548

SECTION 230553 - 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. Warning tags.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- 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.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
 - 1. Material and Thickness: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Letter Color: White.
 - 3. Background Color: Black.
 - 4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 - 5. 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

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

6. Fasteners: Stainless-steel rivets or self-tapping screws.
7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. 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-quarters the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and 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, 1/8 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 160 deg F.
- 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-quarters 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 WARNING TAGS

- A. Description: 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: Brass grommet and wire.
 - 3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
 - 4. Color: Red background with white 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 GENERAL INSTALLATION REQUIREMENTS

- 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.

3.3 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.4 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 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. All services: 2 inches, round.

2. Valve-Tag Colors:

a. All services: Natural

3. Letter Color:

a. All services: Black

3.5 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING 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.

1.2 SUMMARY

- A. Section Includes:
 - 1. Balancing Air Systems:
 - a. Constant-Volume air systems.
 - b. Variable-air-volume systems.
 - 2. Testing, Adjusting, and Balancing Equipment:
 - a. Motors
 - b. Condensing Units
 - 3. Duct leakage tests.
 - 4. Control system verification.

1.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. BAS: Building automation systems.
- C. NEBB: National Environmental Balancing Bureau.
- D. TAB: Testing, adjusting, and balancing.
- E. TABB: Testing, Adjusting, and Balancing Bureau.
- F. TAB Specialist: An independent entity meeting qualifications to perform TAB work.
- G. TDH: Total dynamic head.

1.4 PREINSTALLATION MEETINGS

- A. TAB Conference: Conduct a TAB conference at Project site with the Architect, Construction Manager, Commissioning Authority, and Engineer after approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Provide a minimum of 14 days' advance notice of scheduled meeting time and location.
 - 1. Minimum Agenda Items:

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

- a. The Contract Documents examination report.
- b. The TAB plan.
- c. Needs for coordination and cooperation of trades and subcontractors.
- d. Proposed procedures for documentation and communication flow.

1.5 ACTION SUBMITTALS

- A. Qualification Data: Within **30** days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Contract Documents Examination Report: Within **30** days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.
- C. Strategies and Procedures Plan: Within **30** days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- D. System Readiness Checklists: Within **30** days of Contractor's Notice to Proceed, submit system readiness checklists as specified in "Preparation" Article.
- E. Examination Report: Submit a summary report of the examination review required in "Examination" Article.
- F. Certified TAB reports.
- G. Sample report forms.
- H. Instrument calibration reports, to include the following:
 1. Instrument type and make.
 2. Serial number.
 3. Application.
 4. Dates of use.
 5. Dates of calibration.

1.6 QUALITY ASSURANCE

- A. TAB Specialists Qualifications: The balancing agency shall be an independent contractor certified by NEBB or TABB and shall have no affiliation with a mechanical contracting or sheet metal company and shall have at least one Professional Engineer registered in the State in which the services are to be performed.
 1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC, NEBB, or, TABB.
 2. TAB Technician: Employee of the TAB specialist and certified by AABC, NEBB, or, TABB as a TAB technician.
- B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
- D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.7 FIELD CONDITIONS

- A. Owner Occupancy: Owner may occupy the site, existing building, and/or completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 TAB SPECIALISTS

3.2 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.
- B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- F. Examine equipment performance data including fan and pump curves.
 - 1. 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.
 - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.
- K. Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.
- L. Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.
- M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- N. Examine system pumps to ensure absence of entrained air in the suction piping.
- O. Examine operating safety interlocks and controls on HVAC equipment.
- P. 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.

3.3 PREPARATION

- A. Prepare a TAB plan that includes the following:
 - 1. Equipment and systems to be tested.
 - 2. Strategies and step-by-step procedures for balancing the systems.
 - 3. Instrumentation to be used.
 - 4. Sample forms with specific identification for all equipment.
- B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
 - 1. Airside:
 - a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
 - b. Duct systems are complete with terminals installed.
 - c. Volume, smoke, and fire dampers are open and functional.
 - d. Clean filters are installed.
 - e. Fans are operating, free of vibration, and rotating in correct direction.
 - f. Variable-frequency controllers' startup is complete and safeties are verified.
 - g. Automatic temperature-control systems are operational.
 - h. Ceilings are installed.

- i. Windows and doors are installed.
- j. Suitable access to balancing devices and equipment is provided.

3.4 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" or ASHRAE 111 or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems", SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 - 2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230700 "HVAC Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.5 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- F. Verify that motor starters are equipped with properly sized thermal protection.
- G. Check dampers for proper position to achieve desired airflow path.
- H. Check for airflow blockages.
- I. Check condensate drains for proper connections and functioning.
- J. Check for proper sealing of air-handling-unit components.
- K. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

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 total airflow.
 - a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
 - b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
 - c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
 - d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
 - 2. Measure fan static pressures as follows:
 - a. Measure static pressure directly at the fan outlet or through the flexible connection.
 - b. Measure static pressure directly at the fan inlet or through the flexible connection.
 - c. Measure static pressure across each component that makes up the air-handling system.
 - d. Report artificial loading of filters at the time static pressures are measured.
 - 3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
 - 4. Obtain approval from Engineer for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
 - 5. 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 occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.
 - 1. Measure airflow of submain and branch ducts.
 - 2. Adjust submain and branch duct volume dampers for specified airflow.
 - 3. Re-measure each submain and branch duct after all have been adjusted.
- C. Adjust air inlets and outlets for each space to indicated airflows.
 - 1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
 - 2. Measure inlets and outlets airflow.
 - 3. Adjust each inlet and outlet for specified airflow.
 - 4. Re-measure each inlet and outlet after they have been adjusted.

- D. Verify final system conditions.
 - 1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
 - 2. Re-measure and confirm that total airflow is within design.
 - 3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
 - 4. Mark all final settings.
 - 5. Test system in economizer mode. Verify proper operation and adjust if necessary.
 - 6. Measure and record all operating data.
 - 7. Record final fan-performance data.

3.7 PROCEDURES FOR MOTORS

- A. Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:
 - 1. Manufacturer's name, model number, and serial number.
 - 2. Motor horsepower rating.
 - 3. Motor rpm.
 - 4. Phase and hertz.
 - 5. Nameplate and measured voltage, each phase.
 - 6. Nameplate and measured amperage, each phase.
 - 7. Starter size and thermal-protection-element rating.
 - 8. Service factor and frame size.
- B. Motors Driven by Variable-Frequency Controllers: Test manual bypass of controller to prove proper operation.

3.8 PROCEDURES FOR CONDENSING UNITS

- A. Verify proper rotation of fans.
- B. Measure entering- and leaving-air temperatures.
- C. Record fan and motor operating data.

3.9 DUCT LEAKAGE TESTS

- A. Witness the duct pressure testing performed by Installer.
- B. Verify that proper test methods are used and that leakage rates are within specified tolerances.
- C. Report deficiencies observed.

3.10 CONTROLS VERIFICATION

- A. In conjunction with system balancing, perform the following:
 - 1. Verify temperature control system is operating within the design limitations.

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

2. Confirm that the sequences of operation are in compliance with Contract Documents.
3. Verify that controllers are calibrated and function as intended.
4. Verify that controller set points are as indicated.
5. Verify the operation of lockout or interlock systems.
6. Verify the operation of valve and damper actuators.
7. Verify that controlled devices are properly installed and connected to correct controller.
8. Verify that controlled devices travel freely and are in position indicated by controller: open, closed, or modulating.
9. Verify location and installation of sensors to ensure that they sense only intended temperature, humidity, or pressure.

- B. Reporting: Include a summary of verifications performed, remaining deficiencies, and variations from indicated conditions.

3.11 TOLERANCES

- A. Set HVAC system's airflow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: 0% to +5%.
2. Air Outlets and Inlets: 0% to +5%.

- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.12 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.
3. Certify validity and accuracy of field data.

- B. Final Report Contents: In addition to certified field-report data, include the following:

1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

- C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB specialist.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

7. Contractor's name and address.
 8. Report date.
 9. Signature of TAB supervisor 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's name, type, size, and fittings.
 14. Notes to explain why certain final data in the body of reports vary from indicated values.
 15. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.
 - e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Inlet vane settings for variable-air-volume systems.
 - g. Settings for supply-air, static-pressure controller.
 - h. Other system operating conditions that affect performance.
- D. 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 outdoor, supply, return, and exhaust airflows.
 2. Water and steam 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.
- E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
1. Unit Data:
 - 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. Center-to-center dimensions of sheave and amount of adjustments in inches.
 - j. Number, make, and size of belts.

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

- k. Number, type, and size of filters.
 2. Motor Data:
 - a. Motor 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. Center-to-center dimensions of sheave 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. Outdoor airflow in cfm.
 - j. Return airflow in cfm.
 - k. Outdoor-air damper position.
 - l. Return-air damper position.
 - m. Vortex damper position.
- F. 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. Center-to-center dimensions of sheave and amount of adjustments in inches.
 2. Motor Data:
 - a. Motor 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. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - g. Number, make, and size of belts.
 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. Suction static pressure in inches wg.
- G. Round, Flat-Oval, 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.
- H. Instrument Calibration Reports:
- 1. Report Data:
 - a. Instrument type and make.
 - b. Serial number.
 - c. Application.
 - d. Dates of use.
 - e. Dates of calibration.

3.13 VERIFICATION OF TAB REPORT

- A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Construction Manager.
- B. Construction Manager shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
- C. If 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."
- D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

- E. If TAB work fails, proceed as follows:
 - 1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
 - 2. If the second final inspection also fails, Owner may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
- F. Prepare test and inspection reports.

3.14 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593

SECTION 230700 - HVAC 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. Flexible Elastomeric
 - b. Mineral-Fiber Blanket Insulation
 - c. Mineral-Fiber Preformed Pipe Insulation
 - 2. Adhesives
 - 3. Mastics
 - 4. Tapes

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail attachment and covering of heat tracing inside insulation.
 - 3. Detail insulation application at pipe expansion joints for each type of insulation.
 - 4. Detail insulation application at elbows, fittings, dampers, flanges, valves, and specialties and flanges for each type of insulation.
 - 5. Detail removable insulation at piping specialties and equipment connections.
 - 6. Detail application of field-applied jackets.
 - 7. Detail application at linkages of control devices.

- C. Qualification Data: For qualified Installer.

- D. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing 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 agency.

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 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 sizes and locations of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with Installer for insulation application. Before preparing 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 and, where required, after installing and testing heat tracing. 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. General
 1. Comply with requirements in insulation schedule articles for where insulating materials shall be applied.
 2. Products shall not contain asbestos, lead, mercury, or mercury compounds.
 3. 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.
 4. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
 5. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- B. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type II for sheet materials.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

- a. Aeroflex USA, Inc.; Aerocel.
 - b. Armacell LLC; AP Armaflex.
 - c. K-Flex USA; Insul-Sheet, K-Flex Gray Duct Liner, and K-FLEX LS.
- C. 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 III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corp.; SoftTouch Duct Wrap.
 - b. Johns Manville; Microlite.
 - c. Knauf Insulation; Friendly Feel Duct Wrap.
 - d. Manson Insulation Inc.; Alley Wrap.
 - e. Owens Corning; SOFTR All-Service Duct Wrap.
- D. Mineral-Fiber, Preformed Pipe Insulation:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fibrex Insulations Inc.; Coreplus 1200.
 - b. Johns Manville; Micro-Lok.
 - c. Knauf Insulation; 1000-Degree Pipe Insulation.
 - d. Manson Insulation Inc.; Alley-K.
 - e. Owens Corning; Fiberglas Pipe Insulation.
 2. Type I, 850 deg F (454 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ or ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
 - b. Eagle Bridges - Marathon Industries; 225.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
 - d. Mon-Eco Industries, Inc.; 22-25.

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
 1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Encacel.
 - b. Eagle Bridges - Marathon Industries; 570.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 60-95/60-96.
 2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.033 metric perm) at 30-mil (0.8-mm) dry film thickness.
 3. Service Temperature Range: Minus 50 to plus 220 deg F (Minus 46 to plus 104 deg C).
 4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
 5. Color: White.

2.4 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABI, Ideal Tape Division; 428 AWF ASJ.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
 - c. Compac Corporation; 104 and 105.
 - d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
 2. Width: 3 inches (75 mm).
 3. Thickness: 11.5 mils (0.29 mm).
 4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch (7.2 N/mm) 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABI, Ideal Tape Division; 491 AWF FSK.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
 - c. Compac Corporation; 110 and 111.
 - d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.
 2. Width: 3 inches (75 mm).
 3. Thickness: 6.5 mils (0.16 mm).
 4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
 7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABI, Ideal Tape Division; 370 White PVC tape.
 - b. Compac Corporation; 130.
 - c. Venture Tape; 1506 CW NS.
 2. Width: 2 inches (50 mm).
 3. Thickness: 6 mils (0.15 mm).
 4. Adhesion: 64 ounces force/inch (0.7 N/mm) in width.
 5. Elongation: 500 percent.
 6. Tensile Strength: 18 lbf/inch (3.3 N/mm) in width.
- D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABI, Ideal Tape Division; 488 AWF.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
 - c. Compac Corporation; 120.
 - d. Venture Tape; 3520 CW.
 2. Width: 2 inches (50 mm).
 3. Thickness: 3.7 mils (0.093 mm).
 4. Adhesion: 100 ounces force/inch (1.1 N/mm) in width.
 5. Elongation: 5 percent.
 6. Tensile Strength: 34 lbf/inch (6.2 N/mm) in width.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 - 1. Verify that systems to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
- B. 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 coating to insulated surfaces as follows:
 - 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F). Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
 - 2. 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. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized 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 ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct 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. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

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. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
 - 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).
 4. Seal jacket to wall flashing with flashing sealant.
- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated):
Install insulation continuously through walls and partitions.

3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Comply with manufacturer's written installation instructions and ASTM C1710.
- B. 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.
- C. Square and Rectangular Ducts and Plenums:
1. Provide 1/4 inch more per side for a tight, compression fit.
 2. Cut sheet insulation with the following dimensions:
 - a. Width of duct plus 1/4 inch, one piece.
 - b. Height of duct plus 1/4 inch, plus thickness of insulation, two pieces.
 - c. Width of duct plus 1/4 inch, plus two times the thickness of insulation, one piece.
 3. Insulate the bottom of the duct with the sheet from (a) above, then the sides with the two sheets from (b) above, and finally the top of the duct with the sheet from (c) above.
 4. Insulation without self-adhering backing:
 - a. Apply 100 percent coverage of manufacturer adhesive on the metal surface, then the insulation, except for the last 1/4 inch where sheets will butt together.
 - b. Roll sheet down into position.
 - c. Press two sheets together under compression and apply adhesive at the butt joint to seal the two sheets together.
 5. Insulation with self-adhering backing:
 - a. Peel back release paper in 6- to 8-inch increments and line up sheet.
 - b. Press firmly to activate adhesive.
 - c. Align material and continue to line up correctly, pressing firmly while slowly removing release paper.
 - d. Allow 1/4-inch overlap for compression at butt joints.
 - e. Apply adhesive at the butt joint to seal the two sheets together.
 6. Insulate duct brackets following manufacturer's written installation instructions.

D. Circular Ducts:

1. Determine the circumference of the duct, using a strip of insulation the same thickness as to be used.
2. Cut the sheet to the required size.
3. Apply 100 percent coverage of manufacturer adhesive on the metal surface then the insulation.
4. Apply manufacturer adhesive to the cut surfaces along 100 percent of the longitudinal seam. Press together the seam at the ends and then the middle. Close the entire seam starting from the middle.

3.6 INSTALLATION OF GLASS-FIBER AND MINERAL-WOOL INSULATION FOR DUCTS

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

B. Comply with manufacturer's written installation instructions.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for **100** percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover

insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
 6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.
- C. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for [100] [50] <Insert number> percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
 5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and

inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.

6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.7 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 strainers 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. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
 6. 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.
 7. 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.
 8. 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.

9. 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, pressure temperature taps, test connections, flow meters, sensors, switches, 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.

3.8 INSTALLATION OF CALCIUM SILICATE INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure single-layer insulation with stainless-steel bands at 12-inch intervals and tighten bands without deforming insulation materials.
2. Install two-layer insulation with joints tightly butted and staggered at least 3 inches . Secure inner layer with wire spaced at 12-inch intervals. Secure outer layer with stainless-steel bands at 12-inch intervals.
3. Apply a skim coat of mineral-fiber, hydraulic-setting cement to insulation surface. When cement is dry, apply flood coat of lagging adhesive and press on one layer of glass cloth or tape. Overlap edges at least 1 inch. Apply finish coat of lagging adhesive over glass cloth or tape. Thin finish coat to achieve smooth, uniform finish.

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 block insulation of same material and thickness as pipe insulation.
4. Finish flange insulation same as pipe insulation.

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 insulation sections of insulation are not available, install mitered sections of calcium silicate insulation. Secure insulation materials with wire or bands.
3. Finish fittings insulation same as pipe insulation.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install mitered segments of calcium silicate insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
2. Install insulation to flanges as specified for flange insulation application.
3. Finish valve and specialty insulation same as pipe insulation.

3.9 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION FOR PIPING

- 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 that of 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 sections of pipe insulation and miter if required in accordance with manufacturer's written instructions.
 - 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 prefabricated valve covers manufactured of same material as that of pipe insulation when available.
 - 2. When prefabricated 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.

3.10 INSTALLATION OF GLASS-FIBER AND MINERAL WOOL INSULATION FOR PIPING

- 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 jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches (150 mm) o.c.
 - 4. For insulation with jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, 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 prefabricated 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 glass-fiber or mineral-wool blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install prefabricated sections of same material as that of 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 prefabricated sections of same material as that of straight segments of pipe insulation when available.
2. When prefabricated sections are not available, install fabricated 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.

3.11 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect ductwork, 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(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
2. Inspect pipe, fittings, strainers, and valves, 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 three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
3. 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(s) for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.12 DUCT INSULATION SCHEDULE

- A. General:
 1. Plenums and Ducts Requiring Insulation:
 a. Indoor, concealed supply and return air.
 b. Indoor, exposed supply and return air.

- B. Duct Insulation Schedule:

Duct System	Location	Insulation	Jacket
Supply Return	Indoors	Mineral-Fiber Blanket: 2" thick 0.75-lb/cu. ft.	None

3.13 PIPING INSULATION SCHEDULE

- A. General:
 1. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range.

- B. Pipe, Valve, and Fitting Insulation Material Schedule:

Pipe System	Insulation Material	Vapor Barrier Locations
Refrigerant	Preformed Flexible Elastomeric Insulation	-
Cold Condensate Drain	Preformed Flexible Elastomeric Insulation	-

- C. Pipe, Valve, and Fitting Insulation Thickness Schedule:

Pipe System	Insulation Thickness
Refrigerant	1.5"
Cold Condensate Drain	0.5"

- The above table is based on insulation having a conductivity (k) not exceeding 0.27 Btu per inch/h · ft² °F.
- For insulation with a thermal conductivity not equal to 0.27 Btu · inch/h · ft² · °F at a mean temperature of 75°F, the minimum required pipe thickness is adjusted using the following equation;

$$T = r [(1+tr)K/k-1]$$
 where:
 T = Adjusted insulation thickness (in).
 r = Actual pipe radius (in).
 t = Insulation thickness from applicable cell in table (in).
 K = New thermal conductivity at 75°F (Btu · in/hr · ft² · °F).
 k = 0.27 Btu · in/hr · ft² · °F

END OF SECTION 230713

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SECTION 230900 - HVAC INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes control equipment and installation for HVAC systems and components, including control components for air handling units.

1.2 RELATED DOCUMENTS

- A. Drawings and Specification Sections of the Contract, including General and Supplementary Conditions, apply to this Section.

1.3 DEFINITIONS

- A. BACnet: An industry standard data communication protocol for Building Automation and Control Networks. Refer to ASHRAE standard 135-2010
- B. BIBB: BACnet Interoperability Building Blocks
- C. DDC: Direct digital controls
- D. IP: Internet Protocol
- E. I/O: Input/Output
- F. LAN: Local area network.
- G. MS/TP: Master-slave/token-passing. Refer to AHSRAE standard 135-2010
- H. TCP: Transfer Control Protocol
- I. Scope Terminology
 - 1. Provide = Furnish equipment, engineer, program and install
 - 2. Furnish = Furnish equipment, engineer and program
 - 3. Mount = securely fasten or pipe
 - 4. Install = mount and wire
 - 5. Wire = wire only

1.4 SYSTEM DESCRIPTION

- A. Building Management System (BMS), utilizing direct digital controls.

1.5 WORK INCLUDED

- A. Furnish all labor, materials, equipment, and service necessary for a complete and operating Building Automation System (BMS), utilizing Direct Digital Controls (DDC) as shown on the drawings and described herein.
- B. The BMS shall perform control algorithms, calculations and all monitoring functions. The BMS shall provide operator interaction and dynamic process manipulation, including overall system supervision, coordination and control.
- C. This shall include HVAC control, metering, energy management, alarm monitoring, and all trending, reporting and maintenance management functions related to normal building operations all as indicated on the drawings or elsewhere in this specification.

1.6 SUBMITTALS

- A. Provide submittals for fast-track items that need to be approved and released to meet the schedule of the project.
- B. Provide a complete submittal with all controls system information for approval before construction starts. Include the following:
 - 1. Schematic flow diagrams showing fans, coils, dampers, valves, and control devices.
 - 2. Wiring Diagrams: Power, signal, and control wiring.
 - 3. Details of control panel faces, including sizes, controls, instruments, and labeling.
 - 4. Schedule of valves including leakage and flow characteristics.
 - 5. Written description of the Sequence of Operations.
 - 6. Network riser diagram showing wiring types, network protocols, locations of floor penetrations and number of control panels. Show all routers, switches, hubs and repeaters.
 - 7. Point list for each system controller including both inputs and outputs (I/O), point numbers, controlled device associated with each I/O point, and location of I/O device.
 - 8. Starter and variable frequency drive wiring details of all automatically controlled motors.
 - 9. Reduced size floor plan drawings showing locations of control panels and any devices mounted in occupied space.
- C. Product Data: Include manufacturer's technical literature for each control device indicated, labeled with setting or adjustable range of control. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.
- D. Wiring Diagrams: Detail the wiring of the control devices and the panels. Show point-to-point wiring from field devices to the control panel. Show point-to-point wiring of hardwired

interlocks. Show a ladder diagram or schematic of wiring internal to the panels, including numbered terminals. Clearly designate wiring that is done at a factory, at a panel shop or in the field.

- E. Variance letter: Submit a letter detailing each item in the submission that varies from the contract specification or sequence of operation in any way.

1.7 QUALITY ASSURANCE

A. Codes

1. Perform all wiring in accordance with Division 26, NEC, local codes and Owner's requirements.
2. Uniform Building Code (UBC)
3. 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.
4. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilation Systems."
5. Comply with ASHRAE 135-2010 BACNet: A Data Communication Protocol for Building Automation and Control Networks.
6. All equipment shall be UL listed and approved and shall meet with all applicable NFPA standards, including UL 916 - PAZX Energy Management Systems,
7. Provide UL 864 – UUKL Smoke Control, where controllers and networks are used for that purpose.
 - a. Provide written approvals and certifications after installation has been completed.
8. All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Governing Radio Frequency Electromagnetic Interference and be so labeled.
9. The manufacturer of the building management system shall provide documentation supporting compliance with ISO-9002 (Model for Quality Assurance in Production, Installation, and Servicing) and ISO-140001 (The application of well-accepted business management principles to the environment). The intent of this specification requirement is to ensure that the products from the manufacturer are delivered through a Quality System and Framework that will assure consistency in the products delivered for this project.

B. Qualifications

1. Installing contractor shall be in the business of installing and servicing DDC controls for mechanical systems, temperature and ventilation control, environmental control, lighting control, access and security controls, and energy automation as their primary business. Installer Qualifications: An experienced installer who is the authorized representative of the automatic control system manufacturer for both installation and maintenance of controls required for this Project.

2. Engineering, drafting, programming, and graphics generation shall be performed by the local branch engineers and technicians directly employed by the Building Management System Contractor.
3. Supervision, checkout and commissioning of the system shall be by the local branch engineers and technicians directly employed by the Building Management System Contractor. They shall perform commissioning and complete testing of the BMS system.

C. Final determination of compliance with these specifications shall rest solely with the Engineers and Owner who will require proof of prior satisfactory performance.

D. For any BMS system and equipment submitted for approval, the BMS contractor shall state what, if any, specific points of system operation differ from these specifications.

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 COORDINATION

A. Coordinate location of thermostats, humidistats, panels, and other exposed control components with plans and room details before installation.

B. Coordinate power for control units and operator workstation with electrical contractor.

C. Coordinate equipment with provider of starters and drives to achieve compatibility with motor starter control coils and VFD control wiring.

D. Coordinate scheduling with the mechanical contractor and general contractor. Submit a schedule for approval based upon the installation schedule of the mechanical equipment.

1.10 WARRANTY

A. Conform to the warranty requirement of the Contract Documents, General Requirements and this section or a minimum of 12 months. Provide the strictest.

B. Warranty shall cover all costs for parts, labor, associated travel, and expenses for a period of one year from completion of system demonstration.

C. Hardware and software personnel supporting this warranty agreement shall provide on-site or off-site service in a timely manner after failure notification to the vendor. The maximum acceptable response time to provide this service at the site shall be 24 hours.

D. During normal building occupied hours, failure of items that are critical for system operation shall be provided within 4 hours of notification from the Owner's Representative.

E. This warranty shall apply equally to both hardware and software.

PART 2 - PRODUCTS

2.1 ACCEPTABLE SYSTEMS

- A. Provide and install a dedicated, stand-alone automatic Direct Digital Control system complete with all required software and hardware. This system will directly control all specified mechanical equipment, including air handling units, exhaust fans, duct coils, fan coil units, etc.
- B. The controls contractor shall assume complete responsibility for the entire controls system as a single source. He shall certify that he has on staff under his direct employ on a daily basis, factory trained technical personnel. These employees shall be qualified to project manage, engineer, commission, and service all portions of the control system.
- C. The control system shall be designed such that each mechanical system will be able to operate under stand-alone control. As such, in the event of a network communication failure, or the loss of any other controller, the control system shall continue to independently operate.
- D. The vendors and products listed shall comply with these specifications. It shall not be assumed that standard products and methods will be acceptable without prior approval. Exceptions shall be noted during the bid process and documented in the submittal process.

2.2 MANUFACTURER

- 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include:
 - a. Carrier (Basis of design)
 - b. Honeywell International Inc.; Home & Building Control
 - c. Johnson Controls, Inc.; Controls Group
 - d. Siemens Building Technologies, Inc

2.3 CONTROL PANELS

- A. Controllers in mechanical rooms shall be mounted in NEMA 1 enclosures.
- B. Mount on walls at an approved location or provide a free standing rack.
- C. Panels shall be constructed of 16 gauge, furniture-quality steel, or extruded-aluminum alloy, totally enclosed, with hinged doors and keyed lock and with ANSI 61 gray polyester-powder painted finish, UL listed. Provide common keying for all panels.
- D. Provide power supplies for control voltage power.
- E. Dedicate 1 power supply to the DDC controller. Other devices shall be on a separate power supply, unless the power for the control device is derived from the controller terminations.
- F. Power supplies for controllers shall be a transformer with a fuse or circuit breaker. Power supplies for other devices can be plain transformers.
- G. All power supplies for 24V low voltage wiring shall be class 2 rated and less than 100VA. If low voltage devices require more amps, then provide multiple power supplies. If a single

device requires more amps, then provide a dedicated power supply in a separate enclosure and run a separate, non-class 2 conduit to the device.

- H. Surge transient protection shall be incorporated in design of system to protect electrical components in all DDC Controllers and operator's workstations.
- I. All devices in a panel shall be permanently mounted, including network switches, modems, media converters, etc.
- J. Provide a pocket to hold documentation.

2.4 GENERAL SPECIFICATIONS FOR DEVICES

- A. Provide mounting hardware for all devices, including actuator linkages, wells, installation kits for insertion devices, wall boxes and fudge plates, brackets, etc.
- B. If a special tool is required to mount a device, provide that tool.

2.5 SENSORS

A. Temperature Sensors

- 1. All temperature sensors shall meet the following specifications:
 - a. Accuracy: Plus or minus 0.2 percent at calibration point.
 - b. Wire: Twisted, shielded-pair cable.
 - c. Vibration and corrosion resistant
- 2. Insertion Elements for Liquids shall meet the following specifications:
 - a. Platinum RTD with 4-20mA transmitter
 - b. Threaded mounting with matching well
 - c. Brass well with minimum insertion length of 2-1/2 inches for pipes up to 4" diameter
 - d. Brass well with insertion length of 6 inches for pipes up to 10" diameter
 - e. Junction box for wire splices

B. Air Static Pressure Transmitter shall meet the following specifications:

- 1. Non-directional sensor with suitable range for expected input, and temperature compensated.
- 2. Accuracy: 2 percent of full scale with repeatability of 0.5 percent.
- 3. Output: 4 to 20 mA.
- 4. Building Static-Pressure Range: 0 to 0.25 inches wg.
- 5. Duct Static-Pressure Range: 0 to 5 inches wg.

- C. Pressure Transmitters: Direct acting for gas, liquid or steam service; range suitable for system; proportional output 4-20 mA.
 - 1. 2-wire capacitance.
 - 2. Rated for 0% to 95% RH and 0°F – 140°F.
 - 3. Dual component housing with a moisture barrier completely isolating the electronic circuitry from the field wiring and calibration terminals.
 - 4. Zero and span adjustments.
 - 5. Accuracy shall be $\pm 0.5\%$ of calibrated span.
 - 6. Transmitter shall be furnished complete with factory mounted 3-valve manifold.

- D. Room Temperature Sensors
 - 1. Room sensors shall be constructed for either surface or wall box mounting.
 - 2. Room sensors shall have the following options when specified:
 - a. Setpoint warmer/cooler dial or reset slide switch providing a +3 degree (adjustable) range.
 - b. Individual heating/cooling setpoint slide switches.
 - c. A momentary override request push button for activation of after-hours operation.
 - d. Analog thermometer.

- E. Room Temperature Sensors with Integral Display
 - 1. Room sensors shall be constructed for either surface or wall box mounting.
 - 2. Room sensors shall have an integral LCD display and either a setpoint adjustment dial or setpoint adjustment push buttons, and the following capabilities when specified:
 - a. Display room air temperatures.
 - b. Display and adjust room comfort setpoint.
 - c. Display and adjust fan operation status via push button.
 - d. Override request via Occupancy Override push button with LED status for activation of after-hours operation.
 - e. Override request via setpoint adjustment dial or setpoint adjustment push buttons for activation of after-hours operation.
 - f. Occupancy sensor
 - g. F/C toggle pushbutton to toggle between F and C.
 - h. RH%/Temperature toggle push button to temporarily display RH%

- F. Thermowells
 - a. Thermowell manufacturer shall have models available in stainless steel, brass body, and copper bulb.
 - b. When thermowells are required, the sensor and well shall be supplied as a complete assembly, including wellhead and sensor.
 - c. Thermowells shall be pressure rated and constructed in accordance with the system working pressure.

- d. Thermowells and sensors shall be mounted in a direct mount (no adapter) offering faster installation or 1/2" NPT saddle and allow easy access to the sensor for repair or replacement.
- e. Thermowells constructed of 316 stainless steel shall comply with Canadian Registration Number (CRN) pressure vessel rating.

G. Outside Air Sensors

- a. Outside air sensors shall be designed to withstand the environmental conditions to which they will be exposed. They shall also be provided with a solar shield.
- b. Sensors exposed to wind velocity pressures shall be shielded by a perforated plate that surrounds the sensor element.
- c. Temperature transmitters shall be of NEMA 3R (IP54) or NEMA 4 (IP65) construction and rated for ambient temperatures.
- d. The outdoor sensor can be easily mounted on a roof, pole or side of a building utilizing its already assembled mounting bracket.
- e. Outside Relative Humidity sensors 0-100% full range of accurate measurement. Operating temperature -4 to 140F (-20 to 60C).
- f. Outside temperature sensors operating temperature range is -40 to 140F, +/- .55F (+/- .3C).

H. Duct Mount Sensors

- a. Duct mount sensors shall mount in an electrical box through a hole in the duct, and be positioned so as to be easily accessible for repair or replacement.
- b. Duct sensors shall be insertion type and constructed as a complete assembly, including lock nut and mounting plate.
- c. For outdoor air duct applications, a weatherproof mounting box with weatherproof cover and gasket shall be used.

I. Averaging Sensors

- a. For ductwork greater in any dimension than 48 inches and/or where air temperature stratification exists, an averaging sensor with multiple sensing points shall be used.
- b. For plenum applications, such as mixed air temperature measurements, a continuous averaging sensor or a string of sensors mounted across the plenum shall be used to account for stratification and/or air turbulence. The averaging string shall have a minimum of 4 sensing points per 12-foot long segment.
- c. Capillary supports at the sides of the duct shall be provided to support the sensing string.

J. Humidity Sensors

- 1. The sensor shall be a solid-state type, relative humidity sensor of the Thin Film Capacitance or Bulk Polymer Design. The sensor element shall resist service contamination.

2. The humidity transmitter shall be equipped with non-interactive span and zero adjustments, a 2-wire isolated loop powered, 4-20 mA, 0-100% linear proportional output.
3. The humidity transmitter shall meet the following overall accuracy, including lead loss and Analog to Digital conversion. 3% between 20% and 80% RH @ 77 Deg F unless specified elsewhere.
4. Outside air relative humidity sensors shall be installed with a rain proof, perforated cover. The transmitter shall be installed in a NEMA 3R (IP54) or NEMA 4 (IP65) enclosure with sealite fittings.
5. A single point humidity calibrator shall be provided, if required, for field calibration. Transmitters shall be shipped factory pre-calibrated.
6. Duct type sensing probes shall be constructed of 304 stainless steel, and shall be equipped with a neoprene grommet, bushings, and a mounting bracket.

K. Differential Pressure Transmitters

1. General Air and Water Pressure Transmitter Requirements:
 - a. Pressure transmitters shall be constructed to withstand 100% pressure over-range without damage, and to hold calibrated accuracy when subject to a momentary 40% over-range input.
 - b. Pressure transmitters shall transmit a 0 to 5 VDC, 0 to 10 VDC, or 4 to 20 mA output signal.
 - c. Differential pressure transmitters used for flow measurement shall be sized to the flow sensing device, and shall be supplied with Tee fittings and shut-off valves in the high and low sensing pick-up lines to allow the balancing Contractor and Owner permanent, easy-to-use connection.
 - d. A minimum of a NEMA 1 housing shall be provided for the transmitter. Transmitters shall be located in accessible local control panels wherever possible.

L. Low Differential Water Pressure Applications (0" - 20" w.c.)

- a. The differential pressure transmitter shall be of industrial quality and transmit a linear, 4 to 20 mA output in response to variation of flow meter differential pressure or water pressure sensing points.
- b. The differential pressure transmitter shall have non-interactive zero and span adjustments that are adjustable from the outside cover and meet the following performance specifications:
 - 1) .01-20" w.c. input differential pressure range.
 - 2) 4-20 mA output.
 - 3) Maintain accuracy up to 20 to 1 ratio turndown.
 - 4) Reference Accuracy: +0.2% of full span.

M. Medium to High Differential Water Pressure Applications (Over 21" w.c.)

- a. The differential pressure transmitter shall meet the low pressure transmitter specifications with the following exceptions:

- 1) Differential pressure range 10" w.c. to 300 PSI.
 - 2) Reference Accuracy: +1% of full span (includes non-linearity, hysteresis, and repeatability).
- b. Standalone pressure transmitters shall be mounted in a bypass valve assembly panel. The panel shall be constructed to NEMA 1 standards. The transmitter shall be installed in the panel with high and low connections piped and valved. Air bleed units, bypass valves, and compression fittings shall be provided.
- N. Building Differential Air Pressure Applications (-1" to +1" w.c.)
- a. The differential pressure transmitter shall be of industrial quality and transmit a linear, 4 to 20 mA output in response to variation of differential pressure or air pressure sensing points.
 - b. The differential pressure transmitter shall have non-interactive zero and span adjustments that are adjustable from the outside cover and meet the following performance specifications:
 - 1) -1.00 to +1.00 w.c. input differential pressure ranges. (Select range appropriate for system application)
 - 2) 4-20 mA output.
 - 3) Maintain accuracy up to 20 to 1 ratio turndown.
 - 4) Reference Accuracy: +0.2% of full span.
- O. Low Differential Air Pressure Applications (0" to 2.5" w.c.)
- a. The differential pressure transmitter shall be of industrial quality and transmit a linear, 4 to 20 mA output in response to variation of differential pressure or air pressure sensing points.
 - b. The differential pressure transmitter shall have non-interactive zero and span adjustments that are adjustable from the outside cover and meet the following performance specifications:
 - 1) (0.00 - 1.00" to 5.00") w.c. input differential pressure ranges. (Select range appropriate for system application.)
 - 2) 4-20 mA, 0-5 VDC, 0-10 VDC, output.
 - 3) Maintain accuracy up to 20 to 1 ratio turndown.
 - 4) Reference Accuracy: +0.25%, or 0.5% of full span.
- P. Medium Differential Air Pressure Applications (5" to 21" w.c.)
- a. The pressure transmitter shall be similar to the Low Air Pressure Transmitter, except that the performance specifications are not as severe. Differential pressure transmitters shall be provided that meet the following performance requirements:
 - 1) Zero & span: (c/o F.S./Deg. F): .04% including linearity, hysteresis and repeatability.
 - 2) Accuracy: 1% F.S. (best straight line) Static Pressure Effect: 0.5% F.S. (to 100 PSIG.
 - 3) Thermal Effects: <+.033 F.S./Deg. F. over 40°F. to 100°F. (calibrated at 70°F.).
 - b. Standalone pressure transmitters shall be mounted in a bypass valve assembly panel. The panel shall be constructed to NEMA 1 standards. The transmitter shall be

installed in the panel with high and low connections piped and valved. Air bleed units, bypass valves, and compression fittings shall be provided.

Q. Flow Monitoring

1. Air Flow Monitoring

a. Fan Inlet Air Flow Measuring Stations

- 1) At the inlet of each fan and near the exit of the inlet sound trap, airflow sensors shall be provided that shall continuously monitor the fan air volumes or velocity pressure.
- 2) Each sensor shall be surface mount type. Unit shall be capable of monitoring and reporting the airflow and temperature at each fan inlet location through two or four sensing circuits. If a static pressure manifold is used, it shall incorporate dual offset static tips on the opposing sides of the averaging manifold so as to be insensitive to flow-angle variations of as much as + 20° in the approaching air stream.
- 3) Devices creating fan performance degradation, resulting in additional energy consumption, caused from pressure drop associated with probes or mounting apparatus in the center of the fan inlet are not allowed. The device shall not induce a significant pressure drop, nor shall the sound level within the duct be amplified by its singular or multiple presence in the air stream. Sensor circuit casings shall be constructed of U.L. 94 flame rated, high impact ABS and include a stainless steel thermistor cap that maintains the precise calibrated flow over the heated and ambient measurement points. Each sensor circuit shall consist of two ceramic base, glass encapsulated, thermistors for measuring ambient temperature and velocity. Circuit shall be designed for operation in a wide range of environments, including high humidity (non-condensing) and rapid thermal cycling.

b. Single Probe Air Flow Measuring Sensor

- 1) The single probe airflow-measuring sensor shall be duct mounted with an adjustable sensor insertion length of up to eight inches. The transmitter shall produce a 4-20 mA or 0-10 VDC signal linear to air velocity. The sensor shall be a thermal dispersion and utilize one temperature sensor and a heated thermistor. The sensor pair shall measure the air temperature and airflow velocity.

c. Duct Air Flow Measuring Stations

- 1) Furnish and install, at locations shown on plans or as in accordance with schedules, an equalized air measuring probe system piped to a high performance pressure transducer or an electronic type airflow temperature measuring station.
- 2) Each device shall be designed and built to comply with, and provide results in accordance with, accepted practice as defined for system testing in the ASHRAE Handbook of fundamentals, as well as in the Industrial Ventilation Handbook.

- 3) Assembly shall be AMCA tested and capable of measuring a range from 70 to 5,000 FPM (22 to 1524 MPM).
- 4) Equalized air measuring assembly shall measure to $\pm 3\%$ average and consist of 6063T5 extruded aluminum step sensing blade(s) with anodized finish, plenum-rated polyethylene pressure tubing, brass barbed fittings, mounting hardware and a glass-on-silicone capacitance sensor pressure transducer capable of measuring up to five field-selectable pressure ranges up to 2.5 in. w.c.
- 5) The transducer shall be accurate to $\pm 0.5\%$, or 0.25% of full scale and be contained in a National Electrical Manufacturer's Association (NEMA) 4 (IP-65) enclosure. Transducer shall be factory mounted and piped to high and low pressure ports through fittings made of brass.
- 6) All sensor tubing shall terminate in solid brass barbed fittings.
- 7) Total and static pressure manifolds shall terminate with external ports for connection to control tubing. An identification label shall be placed on each unit casing, listing model number, size, area, and specified airflow capacity.
- 8) Air straightener shall be provided for sizes over 17 square feet (1.6 sq meter).
- 9) Airflow measuring station assemblies shall be fabricated of galvanized steel or aluminum casing of appropriate thickness for slip fits or with 90 Deg. connecting flanges in configuration and size equal to that of the duct into which it is mounted. Each station shall be complete with an air directionalizer and parallel cell profile suppressor (3/4" maximum cell) across the entering air stream and mechanically fastened to the casing in such a way to withstand velocities up to 5000 feet per minute. This air directionalizer and parallel cell honeycomb suppressor shall provide 98% free area, and eliminate turbulent and rotational flow from the air stream prior to the measuring point.
- 10) Electronic air measuring station shall be capable of monitoring and reporting the airflow and temperature at each measuring location through one or more measuring probes containing multiple sensor points and a control transmitter that outputs a 4-20 mA linear signal.
- 11) Probe(s) shall be constructed of an airfoil shaped aluminum extrusion containing the sensor circuit(s).
- 12) Each sensor circuit shall consist of coated thermistors, for temperature and velocity, mounted to a Printed Circuit Board (PCB).
- 13) Probe multiplexer circuit(s) shall include a microprocessor that collects data from each PCB and digitally communicates the average airflow and temperature of each probe to a microprocessor based control transmitter.
- 14) Multiplexer board shall be encased to prevent moisture damage.
- 15) Shielded CAT5e communications cable shall be Underwriters Laboratories Inc.® (UL) plenum-rated with RJ45 terminal connectors. Dust boot covers and gold-plated contacts shall link probes to electronic controller.
- 16) Control transmitter shall be capable of processing independent sensing points and shall operate on a fused 24 VAC supply.

- 17) Control transmitter shall feature a 16 x 2 character alphanumeric LCD screen, digital offset/gain adjustment, continuous performing sensor/transmitter diagnostics, and a visual alarm to detect malfunctions.
 - 18) All electronic components of the assembly shall be Restriction of Hazardous Substances (RoHS) Directive compliant.
 - 19) Installation Considerations
 - a) The maximum allowable pressure loss through the Flow and Static Pressure elements shall not exceed .04" w.c. at 1000 feet per minute, or .11" w.c. at 2000 feet per minute. Each unit shall measure the airflow rate within an accuracy of plus 3-5% as determined by AMCA.
 - b) Where the stations are installed in insulated ducts, the airflow passage of the station shall be the same size as the inside airflow dimension of the duct. Station flanges shall be 1.5 inches to facilitate matching connecting ductwork.
 - c) Where control dampers are shown as part of the airflow measuring station, parallel blade precision controlled volume dampers integral to the station and complete with actuator, and linkage shall be provided.
 - d) Stations shall be installed in strict accordance with the manufacturer's published requirements, and in accordance with ASME Guidelines affecting non-standard approach conditions.
 - 20) All air measuring devices shall be tested according to AMCA Standard 610
- d. Static Pressure Traverse Probe
 - 1) Duct static traverse probes shall be provided where required to monitor duct static pressure. The probe shall contain multiple static pressure sensors located along exterior surface of the cylindrical probe.
 - e. Shielded Static Air Probe
 - 1) A shielded static pressure probe shall be provided at each end of the building. The probe shall have multiple sensing ports, an impulse suppression chamber, and airflow shielding. A suitable probe for indoor and outdoor locations shall be provided.
 - f. Water Flow Monitoring
 - 1) Water flow meters shall be electromagnetic type with integral microprocessor-Based electronics. The meter shall have an accuracy of 0.25%.

R. Power Monitoring Devices

1. Current Measurement (Amps)
 - a. Current measurement shall be by a combination current transformer and a current transducer. The current transformer shall be sized to reduce the full amperage of the monitored circuit to a maximum 5 Amp signal, which will be converted to a 4-20 mA DDC compatible signal for use by the Facility Management System.
 - b. Current Transformer – A split core current transformer shall be provided to monitor motor amps.
 - 1) Operating frequency – 50 - 400 Hz.

- 2) Insulation – 0.6 Kv class 10Kv BIL.
- 3) UL recognized.
- 4) Five amp secondary.
- 5) Select current ration as appropriate for application.

- c. Current Transducer – A current to voltage or current to mA transducer shall be provided. The current transducer shall include:
- 1) 6X input over amp rating for AC inrushes of up to 120 amps.
 - 2) Manufactured to UL 1244.
 - 3) Accuracy: +.5%, Ripple +1%.
 - 4) Minimum load resistance 30kOhm.
 - 5) Input 0-20 Amps.
 - 6) Output 4-20 mA.
 - 7) Transducer shall be powered by a 24VDC regulated power supply (24 VDC +5%).

S. Refrigerant Leak Detectors

1. The refrigerant leak detector shall be a standalone device and shall provide a SPDT output to directly energize the refrigeration room exhaust ventilation fans. The detector shall include a sensor or sensors connected to a control panel. Two relay contacts at the control panel shall provide trouble and alarm indication to the Facility Management System. The alarm relay contact shall also directly energize the exhaust fans.
2. The refrigerant leak detector shall sense the type of refrigerant used in the specified chillers. Multiple sensors shall be required to detect different refrigerants and/or provide proper sensing coverage for the area of the refrigeration room.

T. Smoke Detectors

1. Ionization type air duct detectors shall be furnished as specified elsewhere in Division 16 for installation under Division 23. All wiring for air duct detectors shall be provided under Division 16, Fire Alarm System.

U. Status and Safety Switches

1. General Requirements
 - a. Switches shall be provided to monitor equipment status, safety conditions, and generate alarms at the BMS when a failure or abnormal condition occurs. Safety switches shall be provided with two sets of contacts and shall be interlock hardwired directly to shut down respective equipment. Safety shutdowns shall not be performed solely through software.
2. Current Sensing Switches
 - a. The current sensing switch shall be self-powered with solid-state circuitry and a dry contact output. It shall consist of a current transformer, a solid state current sensing circuit, adjustable trip point, solid state switch, SPDT relay, and an LED indicating the on or off status. A conductor of the load shall be passed through the window of the device. It shall accept over-current up to twice its trip point range.

- b. Current sensing switches shall be used for run status for fans, pumps, and other miscellaneous motor loads.
 - c. Current sensing switches shall be calibrated to show a positive run status only when the motor is operating under load. A motor running with a broken belt or coupling shall indicate a negative run status.
3. Air Filter Status Switches
- a. Differential pressure switches used to monitor air filter status shall be of the automatic reset type with SPDT contacts rated for 2 amps at 120VAC.
 - b. A complete installation kit shall be provided, including: static pressure tops, tubing, fittings, and air filters.
 - c. Provide appropriate scale range and differential adjustment for intended service.
4. Air Flow Switches
- a. Differential pressure flow switches shall be bellows actuated mercury switches or snap acting micro-switches with appropriate scale range and differential adjustment for intended service.
5. Air Pressure Safety Switches
- a. Air pressure safety switches shall be of the manual reset type with SPDT contacts rated for 2 amps at 120VAC.
 - b. Pressure range shall be adjustable with appropriate scale range and differential adjustment for intended service.
6. Water Flow Switches
- a. Water flow switches shall be equal to the Carrier.
7. Low Temperature Limit Switches
- a. The low temperature limit switch shall be of the manual reset type with Double Pole/Single Throw snap acting contacts rated for 16 amps at 120VAC.
 - b. The sensing element shall be a minimum of 15 feet in length and shall react to the coldest 18-inch section. Element shall be mounted horizontally across duct in accordance with manufacturers recommended installation procedures.
 - c. For large duct areas where the sensing element does not provide full coverage of the air stream, additional switches shall be provided as required to provide full protection of the air stream.
- V. Control Relays
1. Control Pilot Relays
- a. Control pilot relays shall be of a modular plug-in design with retaining springs or clips.
 - b. Mounting Bases shall be snap-mount.
 - c. DPDT, 3PDT, or 4PDT relays shall be provided, as appropriate for application.

- d. Contacts shall be rated for 10 amps at 120VAC.
 - e. Relays shall have an integral indicator light and check button.
2. Lighting Control Relays
- a. Lighting control relays shall be latching with integral status contacts.
 - b. Contacts shall be rated for 20 amps at 277 VAC.
 - c. The coil shall be a split low-voltage coil that moves the line voltage contact armature to the ON or OFF latched position.
 - d. Lighting control relays shall be controlled by:
 - 1) Pulsed Tri-state Output – Preferred method.
 - 2) Pulsed Paired Binary Outputs.
 - 3) A Binary Input to the Facility Management System shall monitor integral status contacts on the lighting control relay. Relay status contacts shall be of the “dry-contact” type.
 - e. The relay shall be designed so that power outages do not result in a change-of-state, and so that multiple same state commands will simply maintain the commanded state. Example: Multiple OFF command pulses shall simply keep the contacts in the OFF position.
- W. Electronic Signal Isolation Transducers
- 1. A signal isolation transducer shall be provided whenever an analog output signal from the BMS is to be connected to an external control system as an input (such as a chiller control panel), or is to receive as an input signal from a remote system.
 - 2. The signal isolation transducer shall provide ground plane isolation between systems.
 - 3. Signals shall provide optical isolation between systems.
- X. Electronic/Pneumatic Transducers
- 1. Electronic to Pneumatic transducers shall provide:
 - a. Output: 3-15 PSIG.
 - b. Input: 4-20 mA or 0-10 VDC.
 - c. Manual output adjustment.
 - d. Pressure gauge.
 - e. External replaceable supply air filter.
- Y. Thermostats
- 1. Electric room thermostats of the heavy-duty type shall be provided for unit heaters, cabinet unit heaters, and ventilation fans, where required. All these items shall be provided with concealed adjustment. Finish of covers for all room-type instruments shall match and, unless otherwise indicated or specified, covers shall be manufacturer’s standard finish.
- Z. Fail-Safe:
- 1. Where indicated, provide actuator to fail to an end position.
 - 2. Mechanical spring return mechanism to drive controlled device to an end position (open or close) on loss of power.

3. Electronic fail-safe shall incorporate an active balancing circuit to maintain equal charging rates among the Super Capacitors. The power fail position shall be adjustable between 0 to 100% in 10-degree increments with a 2-second operational delay.

AA. Integral Overload Protection:

1. Provide electronic overload protection throughout the entire operating range in both directions.

BB. Valve Attachment:

1. Attach actuator to valve drive shaft in a way that ensures maximum transfer of power and force without slippage.
2. Actuators shall be capable of being mechanically and electrically paralleled to increase force if required.
3. Directly couple and mount to the valve bonnet stem

CC. Temperature and Humidity:

1. Temperature: Suitable for operating temperature range encountered by application.
2. Humidity: Suitable for humidity range encountered by application; non-condensing environment.

DD. Enclosure:

1. Suitable for ambient conditions encountered by application.
2. NEMA Type 2 for indoor and protected applications.
3. NEMA Type 4 or Type 4X for outdoor and unprotected applications.
4. Provide actuator enclosure with heater and control where required by application.

EE. Select operating speed to be compatible with equipment and system operation.

2.6 THERMAL AIRFLOW STATION

- A. Provide one Airflow Measurement Device (AMD) with temperature output and airflow alarming capability for each measurement location provided on the plans, schedules, and/pr control diagrams to determine the average airflow rate and temperature at each measurement location.
- B. Each AMD shall be provided with a microprocessor-based transmitter and one or more sensor probes.
 1. Devices that have electronic signal processing components on or in the sensor probe are not acceptable.
- C. Airflow measurement shall be field configurable to determine the average Actual or Standard mass airflow rate.
 1. Actual airflow rate calculations shall have the capability of being corrected by the transmitter for altitudes other than sea level.
- D. Temperature measurement shall be field configurable with velocity weighted average as the default, or manual selection of arithmetic average temperature.
- E. Transmitter shall have network communications RS-485 or Ethernet (BACnet).
- F. Basis of design is EBTRON, Inc. GTx116-P+. Products with equal performance is acceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. The project plans shall be thoroughly examined for control device and equipment locations. Any discrepancies, conflicts, or omissions shall be reported to the architect/engineer for resolution before rough-in work is started.
- B. The contractor shall inspect the site to verify that equipment may be installed as shown. Any discrepancies, conflicts, or omissions shall be reported to the engineer for resolution before rough-in work is started.
- C. The contractor shall examine the drawings and specifications for other parts of the work. If head room or space conditions appear inadequate—or if any discrepancies occur between the plans and the contractor’s work and the plans and the work of others—the contractor shall report these discrepancies to the engineer and shall obtain written instructions for any changes necessary to accommodate the contractor’s work with the work of others.

3.2 INSTALLATION

- A. Provide all relays, switches, and all other auxiliaries, accessories, and connections necessary to make a complete operable system in accordance with the sequences specified. All field wiring shall be by this contractor.
- B. Install controls so that adjustments and calibrations can be readily made. Controls are to be installed by the control equipment manufacturer.
- C. Mount surface-mounted control devices on brackets to clear the final finished surface on insulation.
- D. Install equipment level and plumb.
- E. Install control valves horizontally with the power unit up.
- F. Install labels and nameplates on each control panel listing the name of the panel referenced in the graphics and a list of equipment numbers served by that panel.
- G. Furnish hydronic instrument wells, valves, flow meters and other accessories to the mechanical contractor for installation.

3.3 ELECTRICAL WIRING SCOPE

- A. This contractor shall be responsible for power that is not shown on the electrical drawings, to controls furnished by this contractor. If power circuits are shown on the electrical drawings, this contractor shall continue the power run to the control device. If power circuits are not shown, this contractor shall coordinate with the electrical contractor to provide breakers at distribution panels for power to controls. This contractor is then responsible for power from the distribution panel.
 - 1. Coordinate panel locations. If enclosures for panels are shown on the electrical drawings, furnish the enclosures according to the electrician’s installation schedule.

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

- B. This contractor shall be responsible for wiring of any control device that is furnished as part of this section of specification.
- C. Provide network wiring for equipment that is called to be integrated to the BMS.

3.4 ELECTRICAL WIRING AND CONNECTION INSTALLATION

- A. All low voltage control wiring shall be class 2. Control wiring that is not class 2 shall be run in separate conduits from class 2 wiring.
- B. Floor level network wiring between terminal units can be combined with thermostat and other low voltage wiring in the same conduit. All other network wiring shall be in dedicated conduits.
- C. Install raceways, boxes, and cabinets according to Division 26 Section "Raceways and Boxes."
- D. Install building wire and cable according to Division 26 Section "Conductors and Cables."
- E. Installation shall meet the following requirements:
 - 1. Conceal cable and conduit, except in mechanical rooms and areas where other conduit and piping are exposed.
 - 2. Install exposed cable in raceway or conduit.
 - 3. Install concealed cable using plenum rated cable.
 - 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 cables.
 - 7. All wiring in lab areas shall be in conduit.
 - 8. All unsupported risers shall be rigid steel conduit. Supported risers shall be EMT.
- F. Rigid conduit shall be steel, hot dip galvanized, threaded with couplings, $\frac{3}{4}$ inch minimum size, manufactured in accordance with ANSI C-80-1. Electrical metallic tubing (EMT) with compression fittings or intermediate metallic conduit (IMC) may be used as conduit or raceway where permitted by the NEC.
- G. Concealed control conduit and wiring shall be provided in all spaces except in the Mechanical Equipment Rooms and in unfinished spaces. Install in parallel banks with all changes in directions made at 90 degree angles.
- H. Install conduit adjacent to machine to allow service and maintenance.

- I. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.
- J. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.
- K. Ground equipment.

3.5 IDENTIFICATION

- A. Permanent warning labels shall be affixed to all equipment that can be automatically started by the DDC system.
 - 1. Labels shall use white lettering (12-point type or larger) on a red background.
 - 2. Warning labels shall read as follows: C A U T I O N This equipment is operating under automatic control and may start or stop at any time without warning. Switch disconnect to “Off” position before servicing.
- B. Permanent warning labels shall be affixed to all motor starters and all control panels that are connected to multiple power sources utilizing separate disconnects.
 - 1. Labels shall use white lettering (12-point type or larger) on a red background.
 - 2. Warning labels shall read as follows: C A U T I O N This equipment is fed from more than one power source with separate disconnects. Disconnect all power sources before servicing.
- C. Control Equipment and Device labeling:
 - 1. Labels and tags shall match the unique identifiers shown on the as-built drawings.
 - 2. All Enclosures shall be labeled to match the as-built drawing by either control panel name or the names of the DDC controllers inside.
 - 3. All sensors and actuators not in occupied areas shall be tagged.
 - 4. Duct static pressure taps shall be tagged at the location of the pressure tap.
 - 5. Each device inside enclosures shall be tagged.
 - 6. Tags on the terminal units shall be displayed on the Operator Workstation Graphics.
- D. Tags shall be mechanically printed on permanent adhesive backed labeling strips, 12 point height minimum.
- E. Manufacturers’ nameplates and UL or CSA labels are to be visible and legible after equipment is installed.
- F. Identification of Wires

1. Tag each wire with a common identifier on each end of the wire, such as in the control panel and at the device termination.
2. Tag each network wire with a common identifier on each end.
3. Tag each 120V power source with the panel and breaker number it is fed by.

G. Identification of Conduits:

1. Identify the low voltage conduit runs as BMS conduit, power feeds not included.
2. Identify each electric box, junction box, utility box and wiring tray with a blue paint mark or blue permanent adhesive sticker.
3. For conduit runs that run more than 8 ft between junction boxes in 1 room, place a blue identifier at least every 8 feet.
4. Place a blue identifier on each side of where a conduit passed through a wall or other inaccessible path.
5. Identify all BMS communication conduits the same as above.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove malfunctioning units, replace with new units, and retest.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment, and retest.
3. Calibration test controllers by disconnecting input sensors and stimulating operation with compatible signal generator.

B. Replace damaged or malfunctioning controls and equipment.

1. Start, test, and adjust control systems.
2. Demonstrate compliance with requirements, including calibration and testing, and control sequences.
3. Adjust, calibrate, and fine tune circuits and equipment to achieve sequence of operation specified.

3.7 SYSTEM CHECKOUT AND STARTUP

A. Inspect each termination in the control panels and devices to make sure all wires are connected according to the wiring diagrams and all termination are tight.

- B. After the controls devices and panels are installed and power is available to the controls, perform a static checkout of all the points, including the following:
 - 1. Inspect the setup and reading on each temperature sensor against a thermometer to verify its accuracy.
 - 2. Inspect the setup and reading on each humidity sensor against a hygrometer to verify its accuracy.
 - 3. Inspect the reading of each status switch to verify the DDC reads the open and close correctly.
 - 4. Command each relay to open and close to verify its operation.
 - 5. Ramp each modulating actuator to 0%, 25%, 50%, 75% and 100% to verify its operation.
 - 6. Ramp each modulating output signal, such as a VFD speed, to verify its operation.
 - 7. Test each safety device with a real life simulation, for instance check freezestats with ice water, water detectors with water, etc.
- C. Document that each point was verified and operating correctly. Correct each failed point before proceeding to the dynamic startup.
- D. Verify that each DDC controller communicates on its respective network correctly.
- E. After all of the points are verified, and power is available to the mechanical system, coordinate a startup of each system with the mechanical contractor. Include the following tests:
 - 1. Start systems from DDC.
- F. Perform all program changes and debugging of the system for a fully operational system.
- G. Verify that all graphics at the operator workstations correspond to the systems as installed. Verify that the points on the screens appear and react properly. Verify that all adjustable setpoints and manual commands operate from the operator workstations.
- H. After the sequence of operation is verified, setup the trends that are listed in the sequence of operations for logging and archiving for the commissioning procedure.

END OF SECTION 230900

SECTION 232300 - REFRIGERANT 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. Refrigerant pipes and fittings.
 - 2. Refrigerant piping valves and specialties.
 - 3. Refrigerants.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of valve, refrigerant piping, and piping specialty.
- B. Shop Drawings:
 - 1. Show piping size and piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.
 - 2. Show interface and spatial relationships between piping and equipment.
 - 3. Shop Drawing Scale: 1/4 inch equals 1 foot.
- C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to 2010 ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."
- C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.6 PRODUCT STORAGE AND HANDLING

- A. Store piping with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Line Test Pressure for Refrigerant R-410A:
 - 1. Suction Lines for Air-Conditioning Applications: 300 psig.
 - 2. Suction Lines for Heat-Pump Applications: 535 psig.
 - 3. Hot-Gas and Liquid Lines: 535 psig.

2.2 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B 280, Type ACR.
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.
- D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.
- E. Brazing Filler Metals: AWS A5.8/A5.8M.
- F. Flexible Connectors:
 - 1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
 - 2. End Connections: Socket ends.
 - 3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
 - 4. Working Pressure Rating: Factory test at minimum 500 psig.
 - 5. Maximum Operating Temperature: 250 deg F.

2.3 VALVES AND SPECIALTIES

- A. Diaphragm Packless Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Danfoss Inc.
 - b. Heldon Products; Henry Technologies.
 - c. Parker Hannifin Corp.

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

- d. Paul Mueller Company
2. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
 3. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
 4. Operator: Rising stem and hand wheel.
 5. Seat: Nylon.
 6. End Connections: Socket, union, or flanged.
 7. Working Pressure Rating: 500 psig.
 8. Maximum Operating Temperature: 275 deg F.
- B. Packed-Angle Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Danfoss Inc.
 - b. Heldon Products; Henry Technologies.
 - c. Parker Hannifin Corp.
 - d. Paul Mueller Company
 2. Body and Bonnet: Forged brass or cast bronze.
 3. Packing: Molded stem, back seating, and replaceable under pressure.
 4. Operator: Rising stem.
 5. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
 6. Seal Cap: Forged-brass or valox hex cap.
 7. End Connections: Socket, union, threaded, or flanged.
 8. Working Pressure Rating: 500 psig.
 9. Maximum Operating Temperature: 275 deg F.
- C. Safety Relief Valves: Comply with 2010 ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Danfoss Inc.
 - b. Heldon Products; Henry Technologies.
 - c. Parker Hannifin Corp.
 - d. Paul Mueller Company
 2. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
 3. Piston, Closing Spring, and Seat Insert: Stainless steel.
 4. Seat: Polytetrafluoroethylene.
 5. End Connections: Threaded.
 6. Working Pressure Rating: 400 psig.
 7. Maximum Operating Temperature: 240 deg F.

2.4 REFRIGERANTS

- A. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Arkema Inc.
 - b. DuPont Fluorochemicals Div.
 - c. Genetron Refrigerants; Honeywell International Inc.
 - d. Mexichem Fluor Inc

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

- A. Suction Lines NPS 1-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.
- B. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with Alloy HB soldered joints.
- C. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

- A. Install diaphragm packless or packed-angle valves in refrigerant piping where recommended by air-conditioning manufacturer
- B. Install safety relief valves where required by 2010 ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

3.3 PIPING INSTALLATION

- A. 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 Shop Drawings.
- B. Install refrigerant piping according to ASHRAE 15.
- 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.

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping adjacent to machines to allow service and maintenance.
- 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 piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- K. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Section 083113 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.
- L. Install refrigerant piping in protective conduit where installed belowground.
- M. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.
- N. Slope refrigerant piping as follows:
 - 1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
 - 2. Install horizontal suction lines with a uniform slope downward to compressor.
 - 3. Install traps and double risers to entrain oil in vertical runs.
 - 4. Liquid lines may be installed level.
- O. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.
- P. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.
- Q. Identify refrigerant piping and valves according to Section 230553 "Identification for HVAC Piping and Equipment."
- R. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- S. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

3.4 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."
- D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
 - 1. Use Type BCuP (copper-phosphorus) alloy for joining copper socket fittings with copper pipe.
 - 2. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze or steel.

3.5 HANGERS AND SUPPORTS

- A. Comply with requirements for pipe hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
 - 2. Roller hangers and spring hangers for individual horizontal runs 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. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for copper tubing with the following maximum spacing and minimum rod diameters:
 - 1. NPS 1/2: Maximum span, 60 inches; minimum rod, 1/4 inch.
 - 2. NPS 5/8: Maximum span, 60 inches; minimum rod, 1/4 inch.
 - 3. NPS 1: Maximum span, 72 inches; minimum rod, 1/4 inch.
 - 4. NPS 1-1/4: Maximum span, 96 inches; minimum rod, 3/8 inch.
 - 5. NPS 1-1/2: Maximum span, 96 inches; minimum rod, 3/8 inch.
 - 6. NPS 2: Maximum span, 96 inches; minimum rod, 3/8 inch.
 - 7. NPS 2-1/2: Maximum span, 108 inches; minimum rod, 3/8 inch.
 - 8. NPS 3: Maximum span, 10 feet; minimum rod, 3/8 inch.
 - 9. NPS 4: Maximum span, 12 feet; minimum rod, 1/2 inch.
- D. Support multifloor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
1. Comply with ASME B31.5, Chapter VI.
 2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
 3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in "Performance Requirements" Article.
 - a. Fill system with nitrogen to the required test pressure.
 - b. System shall maintain test pressure at the manifold gage throughout duration of test.
 - c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
 - d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.
- B. Prepare test and inspection reports.

3.7 SYSTEM CHARGING

- A. Charge system using the following procedures:
1. Install core in filter dryers after leak test but before evacuation.
 2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
 3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
 4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

- A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.
- B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
- C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.
- D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
1. Open shutoff valves in condenser water circuit.
 2. Verify that compressor oil level is correct.
 3. Open compressor suction and discharge valves.
 4. Open refrigerant valves except bypass valves that are used for other purposes.
 5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

CONTRACT No. 22-523

DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

- E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300

SECTION 233113 - 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.

1.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.

B. Related Sections:

1. Division 23 Section "Hangers and Supports for HVAC Piping and Equipment"
2. Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment"
3. Division 23 Section "Testing, Adjusting, and Balancing for HVAC"
4. Division 23 Section "HVAC Insulation"
5. Division 23 Section "Air Duct Accessories"

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.

1.4 SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.
3. Seismic-restraint devices.

B. Shop Drawings:

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.

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 and seismic restraints.

D. Coordination Drawings: 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. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
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. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - f. Perimeter moldings.

E. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."
- B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

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: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse 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: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," 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 4, "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."

2.2 SINGLE-WALL ROUND 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.

- 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: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse 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."
 - 1. Transverse Joints in Ducts Larger Than 60 Inches (1524 mm) in Diameter: Flanged.
- D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," 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 (2286 mm) in diameter with butt-welded longitudinal seams.
 - 2. Fabricate flat-oval ducts larger than 72 inches (1830 mm) 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 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "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."

2.3 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: G90 (Z275).
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.4 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.

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

B. Two-Part Tape Sealing System:

1. Tape: 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: 3 inches (76 mm).
3. Sealant: Modified styrene acrylic.
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, sealant shall have 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:

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, sealant shall have 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.

2.5 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- 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: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- D. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
- E. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- G. Trapeze and Riser Supports:
 - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 - 2. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

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.

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

- H. Install ducts with a clearance of 1 inch (25 mm), 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 (38 mm).
- 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 "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

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 DUCT SEALING

- A. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. All Ducts: Seal Class A (All Transverse joints, longitudinal seams, and duct wall penetrations)
 - 2. Seal Class is intentionally more stringent than standard SMACNA duct sealing requirements.
 - 3. The maximum leakage allowed in cfm/sf is to be referenced against the seal class listed above and the definitions of seal class from Table 4-1 of the SMACNA HVAC Air Duct Leakage Test Manual.

Seal Class	Leakage Class Allowed
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A	6
B	12
C	24
Round Duct, all classes	3

3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
 - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.
 - 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) 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 blind rivets; support at each floor and at a maximum intervals of 16 feet (5 m).
- 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.

3.5 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.

3.6 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.

3.7 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. Test the following systems:
 - a. Indoor ducts with a pressure class higher than 3-Inch wg, ducts in risers, and supply ducts upstream of terminal units (e.g. VAV boxes, reheat coils, etc.):
 - 1) Test representative duct sections totaling no less than 25 percent of total installed duct area for each designated pressure class.
 - 2) If any of the representative duct sections fail leak testing, then an additional representative duct section totaling no less than 25 percent of total installed duct area shall be tested.
 - 3) If any section of the second 25 percent fails, then the entire system shall be leak tested.
 - b. Outdoor ducts, product-conveying exhaust ducts, and pressurization-critical exhaust ducts:
 - 1) Test 100 percent of total installed duct area for each designated pressure class.
 - c. Leakage test requirements are intentionally more stringent than standard SMACNA requirements.
- 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 days' advance notice for testing.

- 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.

- D. Duct system will be considered defective if it does not pass tests and inspections.

- E. Prepare test and inspection reports.

3.8 DUCT CLEANING

- A. Clean new and existing duct system(s) before testing, adjusting, and balancing.
- 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, humidifiers and dehumidifiers, 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.

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

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.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.9 DUCT SCHEDULE

A. Duct Pressure Class Schedule:

Air System	Pressure Class
Ducts Connected to Air-Handling Units	2-inch wg
Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:	2-inch wg

B. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel or carbon steel coated with zinc-chromate primer.

C. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "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 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "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) Radius-to Diameter Ratio: 1.5.
 - b. Round Elbows, 12 Inches (305 mm) and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches (356 mm) and Larger in Diameter: Welded.

D. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

- 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 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
- a. Velocity 1000 fpm (5 m/s) or Lower: 90-degree tap.
 - b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s): Conical tap.
 - c. Velocity 1500 fpm (7.6 m/s) or Higher: 45-degree lateral.

END OF SECTION 233113

SECTION 233300 - 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.

1.2 SUMMARY

- A. Section Includes:
 - 1. Backdraft and pressure relief dampers.
 - 2. Manual volume dampers.
 - 3. Duct-mounted access doors.
 - 4. Flexible connectors.
 - 5. Duct accessory hardware.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.
 - 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. Control-damper installations.
 - d. 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.
 - e. Duct security bars.
 - f. Wiring Diagrams: For power, signal, and control wiring.
- 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.

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

1.4 MAINTENANCE MATERIAL SUBMITTALS

- 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.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. 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.

2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G90.
 - 2. Exposed-Surface Finish: Mill phosphatized.
- B. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- C. 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.

2.3 BACKDRAFT 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. Greenheck Fan Corporation.
 - 4. Nailor Industries Inc.
 - 5. Pottorff.
 - 6. Ruskin Company.
 - 7. Vent Products Company, Inc.
- B. Description: Gravity balanced.
- C. Maximum Air Velocity: 3000 fpm.
- D. Maximum System Pressure: 4-inch wg.
- E. Frame: Hat-shaped, 20 gage roll-formed galvanized steel or 0.125-inch extruded aluminum, with welded corners and mounting flange.

- F. Blades: Multiple single-piece blades, maximum 6-inch width, 28 gage roll-formed galvanized steel or 0.070-inch extruded aluminum with sealed edges.
- G. Blade Action: Parallel.
- H. Blade Seals: Extruded vinyl, mechanically locked.
- I. Blade Axles:
 - 1. Material: Nonmetallic or plated steel.
- J. Tie Bars and Brackets: Aluminum or Galvanized steel.
- K. Return Spring: Adjustable tension.
- L. Bearings: Steel ball or synthetic pivot bushings.
- 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 for open installations:
 - a. Front mounted in sleeve.
 - 1) Sleeve Thickness: 20 gage minimum.
 - 2) Sleeve Length: 6 inches minimum.
 - b. Screen Mounting: Rear mounted.
 - c. Screen Material: Galvanized steel or Aluminum.
 - d. Screen Type: Insect.
 - 6. 90-degree stops.

2.4 MANUAL VOLUME DAMPERS

A. Manual Volume Dampers

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Air Balance Inc.; a division of Mestek, Inc.
 - b. American Warming and Ventilating; a division of Mestek, Inc.
 - c. Greenheck Fan Corporation.
 - d. Nailor Industries Inc.
 - e. Pottorff.
 - f. Ruskin Company.
 - g. Vent Products Company, Inc.
- 2. Performance
 - a. Comply with AMCA 500-D testing for damper rating.
 - b. Pressures to 4.0 in wg.
 - c. Velocities to 2000 fpm.
 - d. Temperatures to 180 degF.

3. Linkage outside airstream and concealed in jamb.
4. Suitable for horizontal or vertical applications.
5. Frames:
 - a. Frame: Hat-shaped, 0.094-inch- thick galvanized sheet steel, 0.10-inch- thick aluminum sheet channels, or 0.05-inch- thick stainless steel to match material of connecting ductwork.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
6. Blades:
 - a. 6” wide.
 - b. Multiple blade.
 - c. Opposed-blade design.
 - d. Stiffen damper blades for stability.
 - e. Galvanized-steel, extruded aluminum, or stainless-steel to match frame material.
7. Blade Axles: Plated steel.
8. 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.
9. Tie Bars and Brackets: Galvanized steel or aluminum to match frame material.

B. Jackshaft:

1. Size: 0.5-inch diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

C. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.5 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: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
- C. Material: Galvanized steel.
- D. Gage and Shape: Match connecting ductwork.

2.6 DUCT-MOUNTED ACCESS DOORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. American Warming and Ventilating; a division of Mestek, Inc.
 - 2. Cesco Products; a division of Mestek, Inc.
 - 3. Ductmate Industries, Inc.
 - 4. Elgen Manufacturing.
 - 5. Flexmaster U.S.A., Inc.
 - 6. Greenheck Fan Corporation.
 - 7. McGill AirFlow LLC.
 - 8. Nailor Industries Inc.
 - 9. Pottorff.
 - 10. Ventfabrics, Inc.
 - 11. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."
 - 1. Door:
 - a. Double wall, rectangular.
 - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
 - c. Vision panel.
 - d. Hinges and Latches: Continuous piano hinge and cam latches.
 - e. Fabricate doors airtight and suitable for duct pressure class.
 - 2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
 - 3. Number of Hinges and Locks:
 - a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
 - b. Access Doors up to 18 Inches Square: Continuous and two sash locks.
 - c. Access Doors up to 24 by 48 Inches: Continuous and two compression latches with outside and inside handles.
 - d. Access Doors Larger Than 24 by 48 Inches: Continuous and two compression latches with outside and inside handles.

2.7 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 0.0528-inch carbon or 0.0428-inch stainless steel.

D. Fasteners: Carbon or 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.

2.8 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Elgen Manufacturing.
4. Ventfabrics, Inc.
5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 5-3/4 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, 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. 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.

2.9 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.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

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 back-draft dampers on exhaust discharges and outside air intakes. Coordinate with fan specification to determine if backdraft dampers are already provided at the fan unit.
- 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. 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 Engineer.
- F. Set dampers to fully open position before testing, adjusting, and balancing.
- G. Install test holes at fan inlets and outlets and elsewhere as indicated.
- H. 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.
 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. Control devices requiring inspection.
 8. Elsewhere as indicated.
- I. Install access doors with swing against duct static pressure.
- J. Access Door Sizes:
1. One-Hand or Inspection Access: 8 by 5 inches.
 2. Two-Hand Access: 12 by 6 inches.
 3. Head and Hand Access: 18 by 10 inches.
 4. Head and Shoulders Access: 21 by 14 inches.
 5. Body Access: 25 by 14 inches.
 6. Body plus Ladder Access: 25 by 17 inches.
- K. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- L. Install flexible connectors to connect ducts to equipment..
- M. Connect flexible ducts to metal ducts with draw bands.
- N. Install duct test holes where required for testing and balancing purposes.
- O. 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 (6-mm) movement during start and stop of fans.

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 233300

SECTION 233400 - 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. Section Includes:
 - 1. In-line centrifugal fans.
 - 2. Roof downblast centrifugal exhaust fans.
 - 3. Direct drive sidewall mounted propeller fans.

1.3 SUBMITTALS

- A. Product Data:
 - 1. Include rated capacities, furnished specialties, and accessories for each fan.
 - 2. Certified fan performance curves with system operating conditions indicated.
 - 3. Certified fan sound-power ratings.
 - 4. Motor ratings and electrical characteristics, plus motor and electrical accessories.
 - 5. Material thickness and finishes, including color charts.
 - 6. Dampers, including housings, linkages, and operators.
 - 7. Roof curbs.
 - 8. Fan speed controllers.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include diagrams for power, signal, and control wiring.
 - 4. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
 - 5. 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 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 reports.
- E. Operation and Maintenance Data: For centrifugal fans 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, by a qualified testing agency, and marked for intended location and application.
- B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.
- C. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

1.5 COORDINATION

- A. Coordinate size and location of structural-steel support members.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided.
- C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

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. Belts: One set(s) for each belt-driven unit.

PART 2 - PRODUCTS

2.1 IN-LINE CENTRIFUGAL FANS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Greenheck (Basis-of-Design)
 - 2. Loren Cook Company
 - 3. PennBarry
- B. General Description:
 - 1. Base fan performance at standard conditions (density 0.075 Lb/ft³)
 - 2. Performance capabilities up to 5,000 cubic feet per minute (cfm) and static pressure to 1.75 inches of water gauge
 - 3. Fans are available in thirteen sizes with nominal wheel diameters ranging from 8 inches through 16 inches (60 - 160 unit sizes)
 - 4. Normal operating temperature up to 130 Fahrenheit (54.4 Celsius)
 - 5. Applications include: intake, exhaust, return, or make-up air systems
 - 6. Each fan shall bear a permanently affixed manufacturer's engraved metal nameplate containing the model number and individual serial number
- C. Wheel:
 - 1. Non-overloading, backward inclined centrifugal wheel

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

2. Constructed of aluminum
 3. Statically and dynamically balanced in accordance to AMCA Standard 204-05
 4. The wheel cone and fan inlet will be matched and shall have precise running tolerances for maximum performance and operating efficiency
 5. Single thickness blades are securely riveted or welded to a heavy gauge back plate and wheel cone
- D. Motors:
1. Electronically Commutated Motor
 - a. Motor enclosure: Open drip proof
 - b. Motor to be a DC electronic commutation type motor (ECM) specifically designed for fan applications. AC induction type motors are not acceptable. Examples of unacceptable motors are: Shaded Pole, Permanent Split Capacitor (PSC), Split Phase, Capacitor Start and 3 phase induction type motors
 - c. Motors are permanently lubricated, heavy duty ball bearing type to match with the fan load and pre-wired to the specific voltage and phase
 - d. Internal motor circuitry to convert AC power supplied to the fan to DC power to operate the motor
 - e. Motor shall be speed controllable down to 20% of full speed (80% turndown). Speed shall be controlled by either a potentiometer dial mounted at the motor or by a 0-10 VDC signal
 - f. Motor shall be a minimum of 85% efficient at all speeds
- E. Housing/Cabinet Construction:
- a. Square design constructed of heavy gauge galvanized steel and shall include square duct mounting collars
 - b. Housing and bearing supports shall be constructed of heavy gauge bolted and welded steel construction to prevent vibration and to rigidly support the shaft and bearing assembly.
 - c. Galvanized Construction material
- F. Housing Supports and Drive Frame:
- a. Housing supports are constructed of structural steel with formed flanges
 - b. Drive frame is welded steel which supports the motor
- G. Disconnect Switches:
- a. NEMA rated: NEMA 1: indoor application no water. Factory standard.
 - b. Positive electrical shut-off
 - c. Wired from fan motor to junction box
- H. Duct Collars:
- a. Square design to provide a large discharge area
 - b. Inlet and discharge collars provide easy duct connection
- I. Access Panel:
- a. Two sided access panels, permit easy access to all internal components
 - b. Located perpendicular to the motor mounting panel
- J. Options/Accessories:
- a. Dampers:
 - 1) Type: WD-330, Gravity

- 2) Galvanized frames with prepunched mounting holes
- 3) Balanced for minimal resistance to flow

2.2 ROOF DOWNBLAST CENTRIFUGAL EXHAUST FAN

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Greenheck (Basis-of-Design)
 2. Loren Cook Company
 3. PennBarry
- B. General Description:
1. Downblast fan shall be for roof mounted applications
 2. Performance capabilities up to 4,300 cubic feet per minute (cfm) and static pressure to 1 inches of water gauge
 3. Fans are available in sixteen sizes with nominal wheel diameters ranging from 8 inches through 18 inches (071 - 180 unit sizes)
 4. Maximum continuous operating temperature is 180 Fahrenheit (82.2 Celsius)
 5. Each fan shall bear a permanently affixed manufacturer's engraved metal nameplate containing the model number and individual serial number.
- C. Wheel:
1. Constructed of aluminum
 2. Non-overloading, backward inclined centrifugal
 3. Statically and dynamically balanced in accordance to AMCA Standard 204-05
 4. The wheel cone and fan inlet will be matched and shall have precise running tolerances for maximum performance and operating efficiency
- D. Motors:
1. Electronically Commutated Motor
 - a. Motor enclosure: ODP
 - 1) Motor to be a DC electronic commutation type motor (ECM) specifically designed for fan applications. AC induction type motors are not acceptable. Examples of unacceptable motors are: Shaded Pole, Permanent Split Capacitor (PSC), Split Phase, Capacitor Start and 3 phase induction type motors
 - 2) Motors are permanently lubricated, heavy duty ball bearing type to match with the fan load and pre-wired to the specific voltage and phase
 - 3) Internal motor circuitry to convert AC power supplied to the fan to DC power to operate the motor
 - 4) Motor shall be speed controllable down to 20% of full speed (80% turndown). Speed shall be controlled by either a potentiometer dial mounted at the motor or by a 0-10 VDC signal
 - 5) Motor shall be a minimum of 85% efficient at all speeds
- E. Housing:
1. Motor cover, shroud, curb cap, and lower windband shall be constructed of heavy gauge aluminum
 2. Shroud shall have an integral rolled bead for extra strength
 3. Shroud shall be drawn from a disc and direct air downward
 4. Lower windband shall have a formed edge for added strength

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

5. Motor cover shall be drawn from a disc
 6. All housing components shall have final thicknesses equal to or greater than preformed thickness
 7. Curb cap shall have pre-punched mounting holes to ensure correct attachment
 8. Rigid internal support structure
 9. Leak proof
- F. Housing Supports and Drive Frame:
1. Drive frame assemblies shall be constructed of heavy gauge steel and mounted on vibration isolators
- G. Vibration Isolation:
1. Rubber isolators
 2. Sized to match the weight of each fan
- H. Disconnect Switches:
1. NEMA rated: NEMA 1: indoor application no water. Factory standard.
 2. Positive electrical shut-off
 3. Wired from fan motor to junction box installed within motor compartment
- I. Options/Accessories:
1. Birdscreen:
 - a. Material Type: Galvanized
 - b. Protects fan discharge
 2. Dampers:
 - a. Type: WD-100, Gravity
 - b. Prevents outside air from entering back into the building when fan is off
 - c. Balanced for minimal resistance to flow
 - d. Galvanized frames with prepunched mounting holes

2.3 PROPELLER FANS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Greenheck (Basis-of-Design)
 2. Loren Cook Company
 3. PennBarry
 4. Twin City Fan & Blowers
- B. Housing: Galvanized-steel sheet with flanged edges and integral orifice ring with baked-enamel finish coat applied after assembly.
- C. Steel Fan Wheels: Formed-steel blades riveted to heavy-gage steel spider bolted to cast-iron hub.
- D. Fan Wheel: Replaceable, [cast] [extruded]-aluminum, airfoil blades fastened to cast-aluminum hub; factory set pitch angle of blades.
- E. Fan Drive: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.

- F. Fan Drive:
1. Resiliently mounted to housing.
 2. Statically and dynamically balanced.
 3. Selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.
 4. Extend grease fitting to accessible location outside of unit.
 5. Service Factor Based on Fan Motor Size: 1.4.
 6. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
 7. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
 - a. Ball-Bearing Rating Life: ABMA 9, [L₁₀ of 100,000 hours] <Insert life>.
 8. Pulleys: Cast iron with split, tapered bushing; dynamically balanced at factory.
 9. Motor Pulleys: Adjustable pitch for use with motors through [5] <insert value> hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
 10. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
 11. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet.
- G. Options/Accessories:
1. Dampers:
 - a. Type: Gravity
 - b. Prevents outside air from entering back into the building when fan is off
 - c. Balanced for minimal resistance to flow
 - d. Galvanized frames with pre-punched mounting holes
 2. Wall Housing:
 - a. Mounting arrangement: Flush Interior
 - b. Constructed of galvanized steel or painted steel with heavy gauge mounting flanges and pre-punched mounting holes
 - c. Housing shall include OSHA approved motor guard
 - d. Reduces installation time and provides maximum installation flexibility
 3. Wall Collar:
 - a. Constructed of galvanized steel or painted steel with heavy gauge mounting flanges and pre-punched mounting holes.

2.4 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

2.5 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.
- 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/ASHRAE 51, "Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install fans level and plumb.
- 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. Equipment Mounting:
 - 1. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
- E. Ceiling Units: Suspend units from structure; use steel wire or metal straps.
- F. Support suspended units from structure using threaded steel rods and hangers. Vibration-control devices are specified in Section 230548 "Vibration and Seismic Controls for HVAC."
- G. Curb Support: Install roof curb on roof structure, level and secure, according to "The NRCA Roofing and Waterproofing Manual," Low-Slope Membrane Roofing Construction Details Section, Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts." Install and secure centrifugal fans on curbs, and coordinate roof penetrations and flashing with roof construction. Secure units to curb support with anchor bolts.
- H. Unit Support: Install fans level on structural curbs or pilings. Coordinate wall penetrations and flashing with wall construction. Secure units to structural support with anchor bolts.
- I. Install units with clearances for service and maintenance.
- J. Label fans according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

- A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."
- B. Install ducts adjacent to fans to allow service and maintenance.
- C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 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 test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 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. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.
 - 10. Remove and replace malfunctioning units and retest as specified above.
- D. Test and adjust controls and safeties. Controls and equipment will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fans.

END OF SECTION 233416

SECTION 23 34 10 – HVAC CEILING FANS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the ceiling mounted circulation fan as shown on the Drawings and specified herein, including, but not limited to, the following:
 - 1. Airfoil system.
 - 2. Electrical wiring.
 - 3. SenseME Technology.

1.3 RELATED SECTIONS

- A. Section 21 00 00 – Fire Suppression
- B. Section 23 00 00 – Heating, Ventilating, and Air Conditioning (HVAC)
- C. Section 26 00 00 – Electrical

1.4 REFERENCES

- A. National Electric Code (NEC)
- B. National Fire Protection Association (NFPA)
- C. National Electrical Manufacturers Association (NEMA)
- D. Underwriters Laboratories (UL)
- E. Nationally Recognized Testing Laboratory (NRTL)

1.5 SUBMITTALS

- A. Shop Drawings: Drawings detailing product dimensions, weight, and attachment methods.
- B. Product Data: Specification sheets on the ceiling-mounted fan, specifying electrical and installation requirements, features and benefits, and controller information.
- C. Revit Files: Files provided for architectural design
- D. Installation Guide: The manufacturer shall furnish a copy of all installation, operation, and maintenance instructions for the fan. All data is subject to change without notice.

E. Schedule

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum twenty (20) years documented experience, and ISO 9001 compliant.
- B. Installer Qualifications: Authorized representative of the manufacturer with minimum five years documented experience and/or be a factory trained and authorized installation company.
- C. Safety: The fan motor shall be NRTL certified, and built pursuant to:
 - 1. UL 1004-1 Standard for Safety for Rotating Electrical Machines (Part 1)
 - 2. UL 1004-3 Standard for Safety for Thermally Protected Motors
 - 3. UL 1004-7 Standard for Safety for Electronically Protected Motors
- D. Sustainability: Energy Star* certification (most current)

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site in manufacturer's unopened containers or packaging with labels intact. The fan shall be new, free from defects, and factory tested.
- B. Store materials at site to prevent water damage, staining, or other physical damage. Comply with manufacturer's recommendations for job site storage, handling and protection.
- C. Handling: Handle and lift all items carefully during installation to prevent damage and protect finishes.

1.8 WARRANTY

- A. The manufacturer shall replace any products or components defective in material or workmanship for the customer free of charge (including transportation charges within the USA, FOB Lexington, KY), pursuant to the complete terms and conditions of the Big Ass Fans Warranty in accordance to the following schedule:
 - 1. Non-Residential Installations:

Indoor Environment	3 years
Outdoor Environment	2 years
- Labor to repair the defect will be provided free of charge at the Big Ass Fans service center for defects arising during the Warranty Period.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products from the following:

1. Delta T LLC, dba Big Ass Fans

PO Box 11307

Lexington, KY 40575

Phone (877) 244-3267

www.bigassfans.com

2.2 CEILING-MOUNTED CIRCULATION FAN

A. Complete Unit:

1. Approved Product: Model i6, 96” diameter
2. Sustainability Characteristics: The fan shall possess the ENERGY STAR® Most Efficient 2021 designation.
3. Quality: The fan shall display good workmanship in all aspects of its construction. Field balancing of the airfoils shall not be necessary.
4. Colors: Airfoil colors may be selected by the architect or owner as described in 2.2.C, “Airfoils.”
5. Optional Accessories
 - a. A 0–10 V module may be selected at the time of order. The module shall enable the fan to be integrated with a home or building automation system or a third-party 0–10 V dimmer using an industry-standard protocol.
 - b. A BAFCON wall control shall be used and connected to all fans.

B. Mounting System:

1. Direct Mount

- a. The direct mount shall be suitable for flat ceilings as low as 8 ft (2.4 m) tall.
- b. The fan shall be equipped with a mounting plate, safety clips, wiring cover, and motor unit.
- c. The fan shall be available with a diameter of 60” (1.5 m).

2. Universal Mount

- a. The universal mount shall be suitable for flat or sloped ceilings with heights ranging from 9–18 ft (2.7–5.5 m).
- b. The fan shall be equipped with a mounting bracket, wiring cover and trim, downrod assembly, motor cover, and motor unit.
- c. The fan shall be available with a diameter of 60” (1.5 m), 72” (1.8 m), 84” (2.1 m), or 96” (2.4 m).
- d. The fan shall include one (1) downrod. The length of the downrod may be selected at the time of order.

- a. Six-inch (178-mm), 12-inch (508-mm), 24-inch (813-mm), 36-inch (914-mm), 48-inch (1219-mm), and 60-inch (1524-mm) downrods shall be available for 60-inch (1.5-m) and 72-inch (1.8-m) fans.
- b. Twelve-inch (508-mm), 24-inch (813-mm), 36-inch (914-mm), 48-inch (1219-mm), and 60-inch (1524-mm) downrods shall be available for 84-inch (2.1-m) and 96-inch (2.4-m) fans.

C. Airfoils

1. The fan shall be equipped with six airfoils spanning a total diameter of 60” (1.5 m), 72” (1.8 m), 84” (2.1 m), or 96” (2.4 m), as specified by the architect or owner.
2. Airfoils shall be made of aircraft-grade aluminum.
 - a. Airfoils shall be available in Black, White, Silver, Oil-Rubbed Bronze, or Driftwood.
 - b. Airfoils shall be suitable for indoor and outdoor spaces.

D. Motor

1. The fan shall have an electronically commutated motor (ECM) rated for 100–277 VAC, single phase.
2. The motor shall draw 41.6–73.3 watts depending on the speed at which the fan is operated and if a light is installed.
3. The fan shall be designed for continuous operation in ambient temperatures of 32–104°F (0–40°C) and a humidity range of 20–90% (non-condensing).
4. The fan’s motor unit and motor unit trim shall be available in a Black, White, Silver, or Oil-Rubbed Bronze finish, as specified by the architect or owner.

E. Safety Cable

1. The fan shall be equipped with a safety cable that provides an additional means of securing the fan assembly to the building structure. The safety cable shall be 2.4 mm in diameter and fabricated of aircraft stainless steel.
2. Field construction of safety cables is not permitted.

F. SenseME Technology

1. The fan shall be equipped with SenseME Technology for smart automation and shall be able to wirelessly connect to local Ethernet networks or host a network. The fan’s Wi-Fi capability shall permit over-the-air firmware updates.
2. SenseME Technology control features shall be managed by users via the Big Ass Fans mobile app. The Big Ass Fans mobile app shall be supported by Android™ and iOS® mobile devices.
3. Big Ass Fans Mobile App Control Modes

- a. Auto Mode
 - a. Motion Sensor. The fan and light automatically turn on and off depending on whether motion is detected in the room.
 - b. Temperature and Humidity Sensor. The sensor located in the Bluetooth® remote control monitors room temperature and humidity in order to automatically adjust the fan speed to achieve the user’s ideal thermal comfort level.
 - c. Learning. The fan automatically learns the user’s ideal temperature based on observing their manual adjustments to fan speed.
 - b. Scheduling. Sets precise schedules for fan and light control modes.
 - c. Whoosh® Mode. Silently varies fan speed to mimic cooling natural breezes.
 - d. Sleep Mode. Responds to changing conditions to provide customized comfort all night long.
 - e. Rooms. Enables users to group multiple fans in the same space for synchronized operation. Users shall be able to use the Big Ass Fans mobile app to automate fan and light functions or adjust settings manually.
 - f. Manual Speed Control. Speed settings range from 0 (Off) to 7 (High).
 - g. Manual Light Control. The optional LED light has adjustable brightness and On and Off settings, as well as the ability to be controlled by the motion sensor and scheduling features. For fans with an LED light, see 2.2.I, “LED Light.”
 - h. Amazon Alexa Integration. Enables the use of Amazon Alexa to control the fan and light.
 - i. Google Assistant Integration. Enables the use of Google Assistant to control the fan and light.
4. Big Ass Fans Account. Allows for integrated controls between fans and smart thermostats located on the same Wi-Fi network.
- G. Display and Sound
1. Changes to fan settings shall be confirmed with auditory feedback (a beep) and/or visual indication.
- H. Remote Control
1. The fan shall be equipped with a compact Bluetooth remote control that allows intuitive operation of the fan speed and light brightness in the following modes:
 - a. Fan speeds 0 (Off) through 7 (High)
 - b. Auto Mode
 - c. Light brightness 0-100%
- I. LED Light (Optional)
1. The fan shall be equipped with an LED light, as specified by the architect or owner.
 2. The light kit shall include an LED light module with a diffused lens.
 3. The LED light shall attach to the fan using a twist lock mechanism.

4. The LED light shall include a color shifting feature, allowing the user to adjust the color temperature between 2200–6500 K.
5. The LED light shall have a standard lumen option of 1,770 lumens and shall be capable of dimming down to 1%.

J. 0-10 V Module (Optional)

1. The fan shall be equipped with a 0–10 V module, as specified by the architect or owner.
2. The module shall be installed in the fan’s heatsink.
3. The module shall provide independent control of fan speed and light intensity and shall support daisy chaining for one or up to 10 fans.
4. The module shall be compatible with any 0–10 V sinking/sourcing dimmer and with most home or building automation systems.

K. Wall Control (Optional)

1. The fan shall be equipped with a Bluetooth wall control, as specified by the architect or owner.
2. The wall control shall allow intuitive operation of the fan speed and light brightness in the following modes:
3. Fan speeds 0 (Off) through 7 (High)
4. Auto Mode
5. Light brightness 0–100%
6. The wall control shall be 1.77” wide x 4.25” tall x 1.69” thick (45 mm wide x 108 mm tall x 43 mm thick).
7. The wall control shall be made from durable polycarbonate and shall feature backlight illumination and a white finish.
8. The wall control shall have an operating voltage of 100–277 VAC, 1Φ, 50/60 Hz and shall draw <0.2 W.
9. The wall control shall provide control of up to four fans.
10. The wall control shall install to a wall junction box using standard AC wiring and shall require a dedicated circuit.

PART 3 EXECUTION

3.1 PREPARATION

- A. The fan location must have an appropriate ceiling-mounted outlet box marked “Acceptable for Fan Support” of 70 lb (31.8 kg) or less. If there is not an appropriate outlet box already installed at the location, one must be installed on a ceiling joist or beam and be properly wired. Additional mounting options may be available. Consult the installation guide for additional details.
- B. The fan location must be free from obstacles such as lights, cables, or other building components.
- C. Check the fan location for proper electrical requirements.

3.2 INSTALLATION

- A. Install the fan according to the manufacturer’s installation guide, which includes acceptable mounting methods.
- B. Required Distances
 - 1. For 60-inch (1.5-m) and 72-inch (1.8-m) fans, the airfoils must be at least 7 ft (2.1 m) above the floor.
 - 2. For 84-inch (2.1-m) and 96-inch (2.4-m) fans, the airfoils must be at least 8 ft (2.4 m) above the floor.
 - 3. The airfoils must have at least 2 ft (0.6 m) clearance from all obstructions.
 - 4. The fan shall not be located in close proximity to the outputs of HVAC systems or radiant heaters.
- C. Install and set up the Big Ass Fans mobile app according to the manufacturer’s instructions.

3.3 MAINTENANCE

- A. Post Installation Maintenance:
 - 1. Contractor and installer shall provide Owner with complete company name, address phone number, fax number and assigned contact for emergency repairs.

END OF SECTION

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SECTION 233700 – AIR INLETS AND OUTLETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior Outlets and Inlets:
 - a. Registers, grilles, and diffusers
 - 2. Exterior Outlets and inlets:
 - a. Air louvers
 - b. Roof Top hoods

1.3 SYSTEM DESCRIPTION

- A. Design Requirements
 - 1. Registers, Grilles, and Diffusers: Provide all supply, return and exhaust grilles, registers, and diffusers required for all systems.
 - 2. Air Louvers: Provide AMCA-rated louvers for all fresh air intake and exhaust openings, except as otherwise shown or specified in Contract Documents. Cross- reference dimensions of each louver shown on heating drawings with those on the architectural drawings. Notify architect in writing of any discrepancies prior to submitting on louvers.
 - 3. Roof Top Hoods and : Provide fresh air intake and exhaust / relief openings, as shown or specified in Contract Documents. Cross- reference dimensions of each penthouse/ hood shown on heating drawings with those on the architectural drawings. Notify architect in writing of any discrepancies prior to submitting on equipment.

1.4 PERFORMANCE REQUIREMENTS

- A. Interior Outlets and Inlets: Provide outlets and inlets with aspiration ability, temperature mixing, and velocity traverses and decay with distance, throw, pressure drop, and noise criteria ratings equal to or better than specified products.

- B. Exterior Outlets and Inlets Delegated Design: Include comprehensive engineering analysis by a qualified professional engineer, using wind, snow, gravity, and seismic loading criteria as indicated on the code compliance drawings. Factory standard certifications are acceptable for factory standard products; custom certification is required for custom products.
 - 1. Components shall withstand the effects of the specified loads within limits and under conditions indicated without permanent deformation, noise or metal fatigue caused by vibrations or permanent damage to fasteners and anchors.
 - 2. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.
 - 3. Water Entrainment: Limit water penetration through unit to comply with ASHRAE 62.1.

1.5 SUBMITTALS

- A. Comply with requirements of SECTION 01 33 00 - Submittals and as modified below.
- B. Product Data: Submit manufacturer's product literature, technical specifications, performance data, installation instructions, and similar information required to demonstrate compliance with specified requirements. Annotate all selected options, cross referenced to specification and drawing designations. Include tabulated data for all proposed outlets and inlets, showing size, type, cfm, aspiration ability, water entrainment, temperature mixing, and velocity traverses and decay with distance, throw, pressure drop, noise criteria ratings and any other applicable data demonstrating performance equal to or better than specified products.
- C. Shop Drawings: Submit shop drawings showing sizes, construction details, mounting details, capacity, and air flow characteristics for all equipment. Include complete tabulated schedules as indicated below for each of RGD, Louvers, and roof Top Hoods / .
 - 1. Registers, Grilles, and Diffusers (RGD): Include complete tabulated schedule showing locations for each RGD, type, size, capacity as shown on Drawings, and performance data for each RGD furnished, including throw and noise criteria ratings. Indicate selections on data.
 - 2. Air Louvers, and Roof Top Hoods: Include complete tabulated schedule showing locations for each Louver, Roof Top Hood, and Louvered Penthouse, showing type, size, wall and/or roof rough opening size, capacity as shown on Drawings, and performance data for each including pressure drop and water entrainment specifications. Include all this data on coordination drawings and special Mechanical Penetrations of General Construction Envelope coordination drawing.
- D. Contract Closeout Submittals: Comply with requirements of SECTION 01 77 00, including submission of operating and maintenance instructions as item in "Operating and Maintenance Data" manual described in that section.

1.6 SEQUENCING AND SCHEDULING

- A. Deliver Exterior Outlets and Inlets (Louvers, Roof Top Hoods, and) to project in sufficient time for installation in walls as wall construction progresses.
1. Coordinate unit selection to meet requirements of other equipment and installation details (automatic dampers, back draft dampers, etc.).
 2. Verify all opening sizes, locations and mounting arrangements prior to installation.

PART 2 - PRODUCTS

2.1 REGISTERS, GRILLES, AND DIFFUSERS

A. General

1. Provide registers, grilles, and diffusers with border systems that are compatible with adjacent wall and ceiling systems, and that are specifically manufactured to fit into ceiling modules with accurate fit and adequate support. Refer to general construction drawings and specifications for details of adjacent systems.
2. All performance criteria equal to or better than design make as specified and tagged on drawings.
3. Provide factory baked white enamel finish for steel materials and clear or color anodizing for aluminum material as base bid standard finish unless otherwise specified or noted.
4. Provide products by one of the following:
 - a. Krueger or equal.
 - b. Price or equal.
 - c. Anemostat or equal.

B. Registers:

1. TYPE: Double deflection wall supply register; vertical front and horizontal rear vanes with 3/4" spacing between blades, rubber gasket to prevent streaking, vanes individually adjustable; extruded aluminum construction, clear anodized finish. Similar to Krueger "5880V" or "5880H (horizontal front)".
2. TYPE: Double deflection wall supply register; vertical front and horizontal rear vanes with 3/4" spacing between blades, rubber gasket to prevent streaking, vanes individually adjustable; steel construction. Similar to Krueger "880V" or "880H (horizontal front)".
3. TYPE: Heavy duty double deflection wall supply register; vertical front and horizontal rear vanes with 3/4" spacing between blades, rubber gasket to prevent streaking, vanes individually adjustable; 14 gauge steel blades, 18 gauge frame construction. Similar to Krueger "4880V" or "4880H (horizontal front)".

4. TYPE: Double deflection wall supply register; extruded aluminum alloy airfoil cross section vertical front and horizontal rear vanes with 1-1/4", 2", or 3" spacing between and depth of blades, vanes individually adjustable and secured against vibration noise and inadvertent movement with spring wire or nylon tensioning mechanism; 18 gauge mitered steel or extruded aluminum frame with rubber gasket on frame to prevent streaking. Finish shall be custom color baked enamel. Similar to Krueger "6880V" or "6880H (horizontal front)".

C. Grilles

1. TYPE: Eggcrate return grille; 1/2 inch x 1/2 inch x 1 inch deep squares; fabricated aluminum core; flat frame; white baked enamel finish to match ceiling. Neck size and accessories as noted on drawings. Provide frame to fit lay-in ceiling grid or hard ceiling as required. Similar to Krueger "EGC-15".
2. TYPE: Perforated steel return grille; 3/16 inch diameter holes on 1/4 inch centers resulting in a 51 percent free area. The grille back pan shall be constructed of heavy gage steel with a square neck as noted on drawings. Frame to fit lay-in ceiling or hard ceiling as required. Similar to Krueger "6290".
3. TYPE: Single deflection wall return grille; vertical or horizontal vanes, fixed at 0 degrees or 35 degrees (as noted on drawings), with 3/4 inch spacing between blades; aluminum or steel construction as required to match adjoining ductwork. Similar to Krueger "S80" or "S580".
4. TYPE: Stamped face grille of 12-ga aluminum or steel as required matching adjoining ductwork. Face shall have 13/16 inch square holes 1 inch on center and a flat border fixed to a duct collar. Size, accessories, and mount as shown on drawings. Similar to Krueger "1380".
5. TYPE: Heavy duty single deflection wall return grille; horizontal or vertical vanes, fixed at 0 degrees or 40 degrees (as noted on drawings), with 1/2 inch spacing between blades; 14 gauge steel construction. Similar to Krueger "S480".
6. TYPE: Heavy duty floor return grille with 12-ga sheet steel face stamped with 3/4 inch square holes 1 inch on center (1/4" frets between holes) and a flat 2 inch wide border, welded to a 14-ga duct sleeve frame with 12-ga support bars aligned with frets and welded to frame. Countersunk mounting holes 10" on center around perimeter. Finish of abrasion resistant two part urethane paint in color of Architect's choice. Rated for gymnasium floor duty. Similar to AJ Mfg. Inc., "Custom Security Grille".
7. TYPE: Linear slot return grille, no internal blades, single 3/4 inch wide slot, fully concealed extruded aluminum plaster flush mount frame. Provide frames to mount in gypsum ceiling, with end frames for individual and end applications, butt cut with alignment pins for tandem end to end applications, as shown. Provide with blank off strips where shown not connected to duct, and sound lined insulated round tap (duct size indicated on drawings) plenum where shown connected to duct. Design make: Krueger "1975-1" without blades. Other acceptable manufacturers of equivalent product include Titus, Price, Nailor and Anemostat.

8. TYPE: Expanded metal security face grille of 9 gauge carbon steel conforming to ASTM-F 1267 type 1, class 1 or 2, hot dip galvanized finish. For concealed location transfer applications only. Face shall have diamond shaped openings approximately 5/8 inch H x 1-3/4 inch W, cold rolled flat. Install fasteners from the secured side of the wall. Size listed is opening size. Provide 2" minimum overlap all sides as required to secure to structure.
9. TYPE: Welded Wire Mesh, hot dip galvanized steel, minimum 18 gauge wire, 1/4" to 1/2" mesh. For light duty concealed location transfer and duct entry applications only.
10. TYPE: Custom face architectural pattern stamped grille of 3/16" thick steel with or without custom placed mounting holes as required by application. Face shall have air-flow perforations in repeating pattern as selected by Architect from manufacturer's list of 16 custom patterns. Size, accessories, and mount as shown on drawings – sizes larger than manufacturer's maximum shall be fabricated with multiple sections seamed together with custom mullions as required. Similar to AJ Mfg. Inc., "Architectural Lattice Grilles".

D. Supply Diffusers:

1. TYPE: Ceiling air diffuser with stamped steel construction, stamped three ring removable core, 24 inch square face, 4 way pattern, integral round neck of size as noted on drawings. Anti smudge design to prevent streaking. Flush T-bar mount to fit lay-in ceiling grid, coordinate with G.C. Similar to Krueger "1400".
2. TYPE: Ceiling air diffuser of all 16 gauge steel construction, 24 or 12 inch square face, one piece steel back plate, integral round neck of size as noted on drawings. 360 degree horizontal airflow pattern. Flush T-bar mount to fit lay-in ceiling grid. Similar to Krueger "PLQ".
3. TYPE: Steel round face shallow framed ceiling diffuser with fully adjustable core. Three internal distribution cones, regardless of unit size, designed for adjusting air distribution from horizontal along the ceiling through blow down. Diffuser shall have positive latch arrangement and removable core for access to duct. Design make: Krueger "RA". Other acceptable manufacturers of equivalent product include Titus, Price, Nailor and Anemostat.
4. TYPE: Steel round deep framed diffuser specifically designed for downward vertical projection of heated air from high exposed ductwork. Diffuser shall consist of three expanding distribution cones, regardless of unit size, terminating in closed rolled beads and having no external ledge on which a tennis ball or larger sphere may rest. Size, mount, and capacity as shown. Design make: Anemostat "HU-3". Other acceptable manufacturers of equivalent product include Kruger, Titus, Price, and Nailor.
5. TYPE: Ceiling air diffuser, removable core, heavy duty lattice security face with 4 way pattern. Steel construction, 12 ga. faceplate thickness, tamper resistant fasteners. Provide frame to fit exposed duct collar. Similar to Krueger "1340".
6. TYPE: Linear ceiling air diffuser, removable core, extruded aluminum louver style face with one or two way throw as indicated by flow arrows on drawings. Provide frames to surface mount on gypsum ceiling or T-bar mount to fit lay-in ceiling grid, coordinate with G.C. Provide with end frames for individual applications and butt cut with

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

alignment pins for tandem end to end applications as shown on drawings. Design make: Krueger “1701” or “1702”. Other acceptable manufacturers of equivalent product include Titus, Price, Nailor and Anemostat.

7. TYPE: Linear ceiling or side wall supply (or return) register of extruded aluminum bar grille construction. Bar spacing and one way throw at angle indicated on drawings. Provide removable frames to surface mount on gypsum board with concealed hanger bracket. Design make: Krueger “1500” or “1600” series. Other acceptable manufacturers of equivalent product include Titus, Price, Nailor and Anemostat.
8. TYPE: Linear floor supply (or return) register of heavy duty extruded aluminum bar grille construction with one way throw at angle indicated on drawings. Provide removable frames to surface mount with tamper resistant flat or oval head screws. Similar to Krueger “1800” series.
9. TYPE: Linear ceiling or side wall supply diffuser of extruded aluminum slotted construction. Provide extruded aluminum frames to match ceiling types shown on architectural drawings, with fully concealed plaster flush mount frame in gypsum ceilings. Provide end frames for individual and end applications, butt cut with alignment pins for tandem end to end applications as shown. Provide 3/4 inch wide slots with one or two way throw and number of slots indicated by adjacent flow arrows on drawings. Provide adjustable internal blades capable of both pattern and flow adjustment, from horizontal to vertical downblast. Provide sound lined insulated supply plenum with round tap (duct size indicated on drawings) where shown connected to duct, and with blank off strips and no internal adjusters where shown not connected to duct. Design make: Krueger “1975-#”. Other acceptable manufacturers of equivalent product include Titus, Price, Nailor and Anemostat.
10. TYPE: Ceiling air diffuser, removable ‘Thermal Core’ ,high induction type specifically designed for air distribution at temperatures down to 35 degrees Fahrenheit without dumping or forming condensation on the diffuser’s surfaces. The diffusers shall be constructed of die-formed steel with baked enamel finish. Induction core shall be constructed of a fire retardant composite material and shall be able to pass the UL 25/50 Flame Spread and Smoke Spread Test. The back-pans shall be insulated with a closed cell anti-fiber insulating material. The inlet collars shall be sized as scheduled. See drawing for blow patterns and performance criteria. Induction ratio is the primary air divided by the total air motion. Design make: Fairchild Industries Thermal Core High Induction “Omni-LT” series. Other acceptable manufacturers of equivalent product include Price and Nailor.
11. TYPE: Ceiling air diffuser with thermally powered room temperature sensing element and duct sensing changeover element. 16 gauge steel construction, 24 or 12 inch square face as shown, one piece steel back plate and bottom plaque face, integral round neck of size as noted on drawings, 360 degree horizontal airflow pattern. Flush T-bar mount to fit lay-in ceiling grid. Adjustable room temperature sensing element controls cooling mode by varying the supply air volume. The duct temperature sensing changeover element engages the heating mode when the duct has air over 72°F, opening dampers to constant volume heating position. Design make: Krueger AVDP/AVDT. Other acceptable manufacturers of equivalent product include Acutherm Therma-Fuser HC, Thermal Products VFS

12. TYPE: Ceiling air diffuser with up to three-hour fire rated assembly listed with UL, Underwriters Laboratories Fire Resistance Directory. 16 gauge steel construction, 24 or 12 inch square face as shown, removable inner cone assembly with 3 or 4 cone, integral round neck of size as noted on drawings, 360 degree horizontal airflow pattern. Flush T-bar mount to fit lay-in ceiling grid. Non-adjustable, butterfly type ceiling radiation damper. Diffusers shall meet UL time vs. temperature test criteria and NFPA 90A requirements. Thermal Blanket is non-asbestos. Standard 165 Degrees Fahrenheit fusible link. Design make: Price SCD-FD. Other acceptable manufacturers of equivalent product include Nailor and Krueger.

2.2 EXTERIOR OUTLETS AND INLETS

A. Intake and Exhaust Louvers (Fixed Type)

1. Standard Construction Requirements:
 - a. Factory constructed high performance drainable (frame, blades, and head as scheduled) aluminum louvers with storm resistant blades of AMCA rated performance equal to or better than the design make.
 - b. Frame and blades constructed of extruded aluminum, alloy 6063-T5. Nominal wall thickness of 0.081 inches, depth to be 6 inches as noted on drawings.
 - c. Blade angle of 37-1/2 degrees, centered nominally at 5-3/32 inches for the 4 inch deep and at 5-29/32 inch for 6 inch deep louvers. Hidden vertical supports shall allow continuous line appearance up to 120 inches.
 - d. Stainless Steel 1/2 inch mesh x 0.063 inch bird screen secured in a removable frame with SS tamperproof fasteners, on exterior face of louver. Finish same as louver.
 - e. Extended sills constructed of aluminum, alloy 6063 – T5 with a nominal wall thickness of 0.060 inches in a style selected by Architect.
 - f. Provide welded construction for all factory assembled louver components. Provide stainless steel fasteners for all field assembled components.
 - g. Size, type and location as shown on drawings.
 - h. Provide scheduled factory finish as detailed below.
 - 1) Standard mill finish.
 - 2) Kynar: Provide factory applied and baked resin based paint coating, minimum 70% fluoropolymer (PVDF) similar to Kynar 500 or Hylar 5000 as manufactured by the Valspar Corporation. Coating shall meet all performance requirements of AAMA 2605 and ASCA 96. Color as selected by Architect from manufacturer's full range of standard or premium colors including minimum 16 "standard" colors and 12 "premium" colors.

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

- 3) Anodize: Electrolytically deposited color anodized finish complying with Aluminum Association code AA-C22A44. Finish shall be applied to 0.7 mils minimum thickness onto chemically etched and pretreated aluminum extrusion. Color to be selected by Architect.
- i. Provide products by one of the following, with performance as scheduled:
 - 1) Greenheck Model ESD-603 or equal.
 - 2) Similar model by Ruskin, or equal.
 - 3) Similar model by Construction Specialties, Inc. or equal.
2. Thinline Construction Requirements:
- a. Factory constructed aluminum louvers with storm resistant blades of performance equal to or better than the design make.
 - b. Frame and blades constructed of extruded aluminum, alloy 6063-T5. Nominal wall thickness of 0.060 inches, depth to be 1-1/2 or 2 inches as noted in schedule.
 - c. Blade angle of 45 degrees, centered nominally at 1-7/8 inches for the 1-1/2 inch deep and at 3-3/16 inch for 2 inch deep louvers. Hidden vertical supports shall allow continuous line appearance.
 - d. Stainless Steel 1/2 inch mesh x 0.063 inch bird screen secured in a removable frame with SS tamperproof fasteners, on exterior face of louver. Finish same as louver.
 - e. Provide sill, jamb and head flashing extensions as required for weather tight installation, same material and finish as louver, in style selected by Architect.
 - f. Provide welded construction for all factory assembled louver components. Provide stainless steel fasteners for all field assembled components.
 - g. Size, type and location as shown on drawings.
 - h. Provide scheduled factory finish as detailed below:
 - 1) Standard mill finish.
 - 2) Kynar: Provide factory applied and baked resin based paint coating, minimum 70% fluoropolymer (PVDF) similar to Kynar 500 or Hylar 5000 as manufactured by the Valspar Corporation. Coating shall meet all performance requirements of AAMA 2605 and ASCA 96. Color as selected by Architect from manufacturer's full range of standard or premium colors including minimum 16 "standard" colors and 12 "premium" colors.
 - 3) Anodize: Electrolytically deposited color anodized finish complying with Aluminum Association code AA-C22A44. Finish shall be applied to 0.7 mils minimum thickness onto chemically etched and pretreated aluminum extrusion. Color to be selected by Architect.

- i. Provide products by one of the following, with performance as scheduled:
 - 1) Greenheck Model ESD-635, or equal.
 - 2) Similar model by Reliable, or equal.
 - 3) Similar model by Ruskin, or equal.
 - 4) Similar model by Construction Specialties, Inc. or equal.

2.3 ROOF TOP HOODS

A. Dome Style Roof Top Hoods:

1. Rated for snow and wind load shown on Code Compliance Drawings.
2. Designed for intake or exhaust (relief), as shown on the drawings.
 - a. Intake hoods shall have minimum free area at inlet equal to twice the throat cross section.
 - b. Exhaust hoods shall have minimum free area at outlet equal to the throat cross section.
 - c. Provide closed cell insulation adhered to underside of exhaust /relief hoods to prevent condensation.
3. Heavy gauge (0.060 inch) aluminum construction.
4. All vertical seams continuously welded. Tops stressed and sloped for drainage with standing lock-formed seams; slope by cross breaking only of flat top not acceptable. All mechanical fasteners stainless steel.
5. Provide hinged joint between hood and base for ease of service access.
6. Provide 1/2 inch aluminum bird screen, secured in removable frame to underside of opening.
7. Curb: Install units on minimum 12 inch high insulated curb or higher curb as scheduled; factory fabricated similar to Pate “Model PC-5A”.
8. Size and capacity as shown on the drawings.
 - a. Provide scheduled factory finish as detailed below:
 - 1) Standard mill finish.
 - 2) Kynar: Provide factory applied and baked resin based paint coating, minimum 70% fluoropolymer (PVDF) similar to Kynar 500 or Hylar 5000 as manufactured by the Valspar Corporation. Coating shall meet all performance requirements of AAMA 2605 and ASCA 96. Color as selected by Architect from manufacturer’s full range of standard or premium colors including minimum 16 “standard” colors and 12 “premium” colors.

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

- 3) Anodize: Electrolytically deposited color anodized finish complying with Aluminum Association code AA-C22A44. Finish shall be applied to 0.7 mils minimum thickness onto chemically etched and pretreated aluminum extrusion. Color to be selected by Architect.
9. Provide products by one of the following:
 - a. Cook “G” series or equal.
 - b. Greenheck “Fabra Hood” or equal.
 - c. Twin City Fans and Blowers, “MG” series or equal.
- B. Gooseneck Style Roof Top Hoods
1. Factory or shop fabricate according to SMACNA's "HVAC Duct Construction Standards" and as otherwise detailed on drawings, with gooseneck riser outside curb, minimum 4 inches larger each way than curb throat dimensions.
 2. Heavy gauge (0.060 inch) aluminum construction. Any mechanical fasteners stainless steel.
 3. Curb: Provide factory fabricated curb as specified in section 23 05 29, minimum 12 inches high.
 4. Bird Screening: Aluminum, 1/2-inch- square mesh, 0.063-inch wire or Stainless-steel, 1/2-inch- square mesh, 0.047-inch wire.
 5. Capacities, size and Characteristics as indicated on drawings.

2.4

- A. Description:
1. Rated for snow and wind load shown on Code Compliance Drawings.
 2. Extruded aluminum AMCA rated louvers all four sides, 6063-T5 alloy; 0.080 inch thick; with double step weather stop, similar to standard depth louvers described above. Mitered corners.
 3. Provide all aluminum and stainless steel frame with mounting angles in each corner, cross bracing and roof reinforcement as required to achieve wind and snow ratings at size and configuration scheduled, and mounting details for curb and unit. All fasteners stainless steel.
 4. Heavy gauge cross-braken, reinforced aluminum roof with welded corners, 1/8 inch sound deadener and closed cell insulation on underside. Hinged in sections as required for reasonable service access. Roof sections connected with standing seam drip edge detailing.
 5. Penthouses taller than 36”: One side hinged, latched, and lockable for secure access to damper and actuator.

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

6. Provide 1/2 inch x 1/2 inch aluminum bird screen.
7. Curb: Provide 24 inch high factory fabricated curb as specified in section 23 05 29.
8. Size as noted on drawings.
9. Provide scheduled factory finish as detailed below:
 - a. Standard mill finish.
 - b. Kynar: Provide factory applied and baked resin based paint coating, minimum 70% fluoropolymer (PVDF) similar to Kynar 500 or Hylar 5000 as manufactured by the Valspar Corporation. Coating shall meet all performance requirements of AAMA 2605 and ASCA 96. Color as selected by Architect from manufacturer's full range of standard or premium colors including minimum 16 "standard" colors and 12 "premium" colors.
 - c. Anodize: Electrolytically deposited clear or color anodized finish complying with Aluminum Association code AA-C22A44. Finish shall be applied to 0.8 mils minimum thickness onto chemically etched and pretreated aluminum extrusion. Color to be selected by Architect.
10. Provide products by one of the following, with custom options as required:
 - a. Loren Cook "TRE" series or equal.
 - b. Greenheck "Custom Louvered Penthouse" Model "WRH/WIH" or equal.
 - c. Twin City Fans and Blowers, Model "TEL/"TIL" or equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine conditions under which air outlets and inlets are to be installed and notify a Architect in writing of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in an acceptable manner.
 1. Air Louvers: Coordinate unit selection to meet other equipment and installation details (automatic dampers, back draft dampers, etc.). Verify all opening sizes, locations and mounting arrangements prior to installation.

3.2 INSTALLATION

- A. Install air outlets and inlets in strict accordance with manufacturer's recommended installation instructions for applications shown on Drawings.
- B. Registers, Grilles and Diffusers (RGD): Install all RGDs in accordance with manufacturer's installation instructions and SMACNA installation manual at locations indicated on Drawings.

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

1. Adjust each type of RGD as required to achieve even air distribution throughout occupied space, generally free of objectionable drafts and dead air pockets. Demonstrate adjustments of distribution to Owner and additionally adjust as requested by Owner's representative during or subsequent to initial adjustments. As RGD adjustment and Testing and Air Balancing work affect each other, make preliminary adjustment to all RGDs prior to balancing, and make final RGD adjustment during TAB work in cooperation with TAB agency. Refer to section 23 05 93 – TESTING, ADJUSTING, AND BALANCING FOR HVAC for more detail.
 2. Provide final balancing in accordance with SECTION 23 05 93.
 3. Furnish to Owner, with receipt, 3 operating keys for each type of air outlet and inlet that requires them.
- C. Air Louvers: Comply with manufacturer's specifications and recommendations for assembly and installation of air louver units, hardware, operators, and other components.
1. Set units plumb, level, and true to line, without warp or rack of frames. Anchor securely in place. Separate aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials. Use stainless steel fasteners.
 2. Make suitable provision for thermal expansion in assembly of groups of units.
 3. Set head, jamb, and sill members in bed of compound as shown, or with joint fillers or gaskets as shown to provide weather tight construction.
 4. Provide suitable gaskets or coating where dissimilar metals are in contact.
 5. Clean aluminum surfaces promptly after installation of units. Remove excess glazing and sealant compounds, dirt, and other substances. Lubricate hardware and other moving parts.
- D. Roof-Mounted Hoods
1. Provide roof curbs in sufficient time to coordinate with construction schedule.
 2. Verify all opening sizes, locations, and mounting arrangements prior to installation.
 3. Comply with applicable requirements of SECTION 23 05 29 – Hangars and Supports for HVAC Piping and Equipment.
 4. Comply with manufacturer's requirements for securing to curbs. Use appropriate weatherproof gasketing and stainless steel fasteners as required meeting loading requirements specified above.

END OF SECTION 23 37 00

SECTION 23 74 00 - PACKAGED, OUTDOOR, ROOFTOP AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes packaged, outdoor, central-station air-handling units (rooftop units) with the following components and accessories:
 - 1. Direct-expansion cooling.
 - 2. Heat-pump refrigeration components.
 - 3. Economizer outdoor- and return-air damper section.
 - 4. Roof curbs.

1.3 DEFINITIONS

- A. DDC: Direct-digital controls.
- B. ECM: Electrically commutated motor.
- C. Outdoor-Air Refrigerant Coil: Refrigerant coil in the outdoor-air stream to reject heat during cooling operations and to absorb heat during heating operations. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.
- D. Outdoor-Air Refrigerant-Coil Fan: The outdoor-air refrigerant-coil fan in RTUs. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.
- E. RTU: Rooftop unit. As used in this Section, this abbreviation means packaged, outdoor, central-station air-handling units. This abbreviation is used regardless of whether the unit is mounted on the roof or on a concrete base on ground.
- F. Supply-Air Fan: The fan providing supply air to conditioned space. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.
- G. Supply-Air Refrigerant Coil: Refrigerant coil in the supply-air stream to absorb heat (provide cooling) during cooling operations and to reject heat (provide heating) during heating operations. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.
- H. VVT: Variable-air volume and temperature.

1.4 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: RTUs shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
 - 1. 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."

1.5 SUBMITTALS, GENERAL

- A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.6 ACTION SUBMITTALS

- A. Product Data: Include manufacturer's technical data for each RTU, including rated capacities, dimensions, required clearances, 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.

1.7 INFORMATIONAL SUBMITTALS

- A. Manufacturer Seismic Qualification Certification: Submit certification that RTUs, accessories, and components will withstand seismic forces defined in "Performance Requirements" Article and in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
 - 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.
- B. Coordination Drawings: Plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Structural members to which RTUs will be attached.
 - 2. Roof openings
 - 3. Roof curbs and flashing.
- C. Warranty: Special warranty specified in this Section.

1.8 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For RTUs to include in emergency, operation, and maintenance manuals.
- B. Warranty: Executed special warranty specified in this Section.

1.9 QUALITY ASSURANCE

- A. ARI Compliance:
 - 1. Comply with ARI 210/240 and ARI 340/360 for testing and rating energy efficiencies for RTUs.
 - 2. Comply with ARI 270 for testing and rating sound performance for RTUs.
- B. ASHRAE Compliance:
 - 1. Comply with ASHRAE 15 for refrigeration system safety.
 - 2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
 - 3. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- D. NFPA Compliance: Comply with NFPA 90A and NFPA 90B.
- E. UL Compliance: Comply with UL 1995.
- F. 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.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components of RTUs that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for Compressors: Manufacturer's standard, but not less than 5 years from date of Substantial Completion.
 - 2. Warranty Period for Control Boards: Manufacturer's standard, but not less than 3 years from date of Substantial Completion.

1.11 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 Belts: One set for each belt-driven fan.
 - 2. Filters: Three sets of filters for each unit.

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. AAON, Inc.
 2. Addison Products Company.
 3. Carrier Corporation.
 4. Engineered Air.
 5. Lennox Industries Inc.
 6. McQuay International.
 7. Trane; American Standard Companies, Inc.
 8. YORK International Corporation.

2.2 CASING

- A. General Fabrication Requirements for Casings: Formed and reinforced double-wall insulated panels, fabricated to allow removal for access to internal parts and components, with joints between sections sealed.
- B. Exterior Casing Material: Galvanized steel with factory-painted finish, with pitched roof panels and knockouts with grommet seals for electrical and piping connections and lifting lugs.
- C. Inner Casing Fabrication Requirements:
1. Inside Casing: Galvanized steel.
- D. Casing Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.
1. Materials: ASTM C 1071, Type I.
 2. Liner materials shall have air-stream surface coated with an erosion- and temperature-resistant coating or faced with a plain or coated fibrous mat or fabric.
 3. Liner Adhesive: Comply with ASTM C 916, Type I.
- E. Condensate Drain Pans: Formed sections of galvanized or stainless-steel sheet, a minimum of 2 inches deep, and complying with ASHRAE 62.1.
1. Double-Wall Construction: Fill space between walls with foam insulation and seal moisture tight.
 2. Drain Connections: Threaded nipple both sides of drain pan.
 3. Pan-Top Surface Coating: Corrosion-resistant compound.
- F. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

2.3 FANS

- A. Size / design for mid-life filter resistance equal to the average of the as specified clean filter resistance at the design flowrate and the filter manufacturer's recommended maximum (in need of changing) filter resistance at the design flow rate.
- B. Direct-Driven Supply-Air Fans: Double width, forward curved centrifugal; with permanently lubricated, multispeed ECM motor resiliently mounted in the fan inlet. Aluminum or painted-steel wheels, and galvanized- or painted-steel fan scrolls.
- C. Belt-Driven Supply-Air Fans: Double width, forward curved, centrifugal; with permanently lubricated, single-speed motor installed on an adjustable fan base resiliently mounted in the casing. Aluminum or painted-steel wheels, and galvanized- or painted-steel fan scrolls.
- D. Condenser-Coil Fan: Propeller, mounted on shaft of permanently lubricated motor.
- E. Seismic Fabrication Requirements: Fabricate fan section, internal mounting frame and attachment to fans, fan housings, motors, casings, accessories, and other fan section components with reinforcement strong enough to withstand seismic forces defined in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment" when fan-mounted frame and RTU-mounted frame are anchored to building structure.
- F. Fan Motor: Comply with requirements in Division 23 Section "Common Electrical Requirements for HVAC Equipment."

2.4 COILS

- A. Supply-Air Refrigerant Coil:
 - 1. Copper-plate fin and seamless internally grooved copper tube in steel casing with equalizing-type vertical distributor.
 - 2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.
 - 3. Cathodic epoxy coating.
 - 4. Condensate Drain Pan: Galvanized steel with corrosion-resistant coating formed with pitch and drain connections complying with ASHRAE 62.1.
- B. Outdoor-Air Refrigerant Coil:
 - 1. Copper-plate fin and seamless internally grooved copper tube in steel casing with equalizing-type vertical distributor.
 - 2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.
 - 3. Cathodic epoxy coating.
- C. Hot-Gas Reheat Refrigerant Coil:
 - 1. Copper-plate fin and seamless internally grooved copper tube in steel casing with equalizing-type vertical distributor.

2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.
3. Cathodic epoxy coating.

D. Electric-Resistance Heating:

1. Open Heating Elements: Resistance wire of 80 percent nickel and 20 percent chromium, supported and insulated by floating ceramic bushings recessed into casing openings, fastened to supporting brackets, and mounted in galvanized-steel frame. Terminate elements in stainless-steel machine-staked terminals secured with stainless-steel hardware.
2. Overtemperature Protection: Disk-type, automatically reset, thermal-cutout, safety device; serviceable through terminal box.
3. Overcurrent Protection: Manual-reset thermal cutouts, factory wired in each heater stage.
4. Control Panel: Unit mounted with disconnecting means and overcurrent protection. Include the following controls:
 - a. Magnetic contactors.
 - b. Step Controller: Pilot lights and override toggle switch for each step.
 - c. SCR Controller: Pilot lights operate on load ratio, a minimum of five steps.
 - d. Time-delay relay.
 - e. Airflow proving switch.

2.5 REFRIGERANT CIRCUIT COMPONENTS

- A. Compressor: Hermetic, scroll, mounted on vibration isolators; with internal overcurrent and high-temperature protection, internal pressure relief and crankcase heater.
- B. Refrigeration Specialties:
 1. Refrigerant: R-407C or R-410A.
 2. Expansion valve with replaceable thermostatic element.
 3. Refrigerant filter/dryer.
 4. Manual-reset high-pressure safety switch.
 5. Automatic-reset low-pressure safety switch.
 6. Minimum off-time relay.
 7. Automatic-reset compressor motor thermal overload.
 8. Brass service valves installed in compressor suction and liquid lines.
 9. Low-ambient kit high-pressure sensor.
 10. Hot-gas reheat solenoid valve with a replaceable magnetic coil.
 11. Hot-gas bypass solenoid valve with a replaceable magnetic coil.
 12. Four-way reversing valve with a replaceable magnetic coil, thermostatic expansion valves with bypass check valves, and a suction line accumulator.

2.6 AIR FILTRATION

- A. Minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
 - 1. Glass Fiber: Minimum 80 percent arrestance, and MERV 5.
 - 2. Pleated: Minimum 90 percent arrestance, and MERV 7.
 - 3. Pleated: Minimum MERV 13.

2.7 DAMPERS

- A. Outdoor-Air Damper: Linked damper blades, for 0 to 25 percent outdoor air, with motorized damper filter.
- B. Outdoor- and Return-Air Mixing Dampers: Parallel- or opposed-blade galvanized-steel dampers mechanically fastened to cadmium plated for galvanized-steel operating rod in reinforced cabinet. Connect operating rods with common linkage and interconnect linkages so dampers operate simultaneously.
 - 1. Damper Motor: Modulating with adjustable minimum position.
 - 2. Relief-Air Damper: Gravity actuated or motorized, as required by ASHRAE/IESNA 90.1, with bird screen and hood.

2.8 ELECTRICAL POWER CONNECTION

- A. Provide for single connection of power to unit with unit-mounted disconnect switch accessible from outside unit and control-circuit transformer with built-in overcurrent protection.

2.9 CONTROLS

- A. Control equipment and sequence of operation are specified in Division 23 Section "Instrumentation and Control for HVAC."

2.10 ACCESSORIES

- A. Electric heater with integral thermostat maintains minimum 50 deg F temperature in gas burner compartment.
- B. Duplex, 115-V, ground-fault-interrupter outlet with 15-A overcurrent protection. Include transformer if required.
- C. Low-ambient kit using variable-speed condenser fans for operation down to 35 deg F.
- D. Filter differential pressure switch with sensor tubing on either side of filter. Set for final filter pressure loss.
- E. Coil guards of painted, galvanized-steel wire.
- F. Hail guards of galvanized steel, painted to match casing.
- G. Concentric diffuser with white louvers and polished aluminum return grilles, insulated diffuser box with mounting flanges, and interior transition.

2.11 ROOF CURBS

- A. Roof curbs with vibration isolators and wind or seismic restraints are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
- B. Materials: Galvanized steel with corrosion-protection coating, watertight gaskets, and factory-installed wood nailer; complying with NRCA standards.
 - 1. Curb Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.
 - a. Materials: ASTM C 1071, Type I or II.
 - b. Thickness: 1 inch.
 - 2. Application: Factory applied with adhesive and mechanical fasteners to the internal surface of curb.
 - a. Liner Adhesive: Comply with ASTM C 916, Type I.
 - b. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
 - c. Liner materials applied in this location shall have air-stream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity.
 - d. Liner Adhesive: Comply with ASTM C 916, Type I.
- C. Curb Height: 24 inches.
- D. Wind and Seismic Restraints: Metal brackets compatible with the curb and casing, painted to match RTU, used to anchor unit to the curb, and designed for loads at Project site. Comply with requirements in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment" for wind-load requirements.

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 RTUs.
- B. Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.
- C. Examine roofs for suitable conditions where RTUs will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.
- E. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 INSTALLATION

- A. Roof Curb: Install on roof structure or concrete base, level and secure, according to NRCA's "Low-Slope Membrane Roofing Construction Details Manual," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts." Install RTUs on curbs and coordinate roof penetrations and flashing with roof construction specified in Division 07 Section "Roof Accessories." Secure RTUs to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.
- B. Unit Support: Install unit level on structural curbs. Coordinate wall penetrations and flashing with wall construction. Secure RTUs to structural support with anchor bolts.
- C. Install wind and seismic restraints according to manufacturer's written instructions. Wind and seismically restrained vibration isolation roof-curb rails are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

3.3 CONNECTIONS

- A. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.
- B. Duct installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:
 - 1. Install ducts to termination at top of roof curb.
 - 2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
 - 3. Connect supply ducts to RTUs with flexible duct connectors specified in Division 23 Section "Air Duct Accessories."
 - 4. Install return-air duct continuously through roof structure.
 - 5. Install normal-weight, 3000-psi, compressive strength (28-day) concrete mix inside roof curb, 4 inches thick. Concrete, formwork, and reinforcement are specified in Division 03.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.
- B. Perform tests and inspections and prepare test reports.
 - 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. Report results in writing.

C. Tests and Inspections:

1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
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.

D. Remove and replace malfunctioning units and retest as specified above.

3.5 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Complete installation and startup checks according to manufacturer's written instructions and do the following:

1. Inspect for visible damage to unit casing.
2. Inspect for visible damage to furnace combustion chamber.
3. Inspect for visible damage to compressor, coils, and fans.
4. Inspect internal insulation.
5. Verify that labels are clearly visible.
6. Verify that clearances have been provided for servicing.
7. Verify that controls are connected and operable.
8. Verify that filters are installed.
9. Clean condenser coil and inspect for construction debris.
10. Clean furnace flue and inspect for construction debris.
11. Connect and purge gas line.
12. Remove packing from vibration isolators.
13. Inspect operation of barometric relief dampers.
14. Verify lubrication on fan and motor bearings.
15. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
16. Adjust fan belts to proper alignment and tension.

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

17. Start unit according to manufacturer's written instructions.
 - a. Start refrigeration system.
 - b. Do not operate below recommended low-ambient temperature.
 - c. Complete startup sheets and attach copy with Contractor's startup report.
18. Inspect and record performance of interlocks and protective devices; verify sequences.
19. Operate unit for an initial period as recommended or required by manufacturer.
20. Perform the following operations for both minimum and maximum firing. Adjust burner for peak efficiency.
 - a. Measure gas pressure on manifold.
 - b. Inspect operation of power vents.
 - c. Measure combustion-air temperature at inlet to combustion chamber.
 - d. Measure flue-gas temperature at furnace discharge.
 - e. Perform flue-gas analysis. Measure and record flue-gas carbon dioxide and oxygen concentration.
 - f. Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.
21. Calibrate thermostats.
22. Adjust and inspect high-temperature limits.
23. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
24. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters.

3.6 CLEANING AND ADJUSTING

- A. 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 site during other-than-normal occupancy hours for this purpose.
- B. After completing system installation and testing, adjusting, and balancing RTU and air-distribution systems, clean filter housings and install new filters.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain RTUs. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 23 74 00

CONTRACT No. 22-523
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

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SECTION 23 82 00 – TERMINAL HEATING AND COOLING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes packaged through wall air conditioners, blower-coil units, fan-coil units, convectors, fin tube radiation, unit heaters, air coils, panel radiation, infrared tubular heaters, and accessories with the following heating and cooling features:
 - 1. Electric heating coil.
 - 2. Direct-expansion refrigerant cooling coil.

1.3 SUBMITTALS, GENERAL

- A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, and furnished specialties and accessories for each unit type and configuration.
- 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 anchorages and attachments to structure and to supported equipment.
 - 3. Wiring Diagrams: Power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. 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 components.
 - 2. Method of attaching hangers to building structure.

CONTRACT No. 20-501
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

3. Size and location of initial access modules for acoustical tile.
4. Size and location of access panels in hard ceilings to provide access to concealed units.
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.

B. Warranty: Special warranty specified in this Section.

1.6 CLOSEOUT SUBMITTALS

A. Field quality-control test reports.

B. Operation and Maintenance Data: For unit ventilators blower-coil units, fan-coil units, convectors, fin tube radiation, unit heaters, and air coils to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Maintenance schedules and repair part lists for motors, coils, integral controls, and filters.

C. Warranty: Executed special warranty specified in this Section.

1.7 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.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

D. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.8 COORDINATION

CONTRACT No. 20-501
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

- A. Coordinate layout and installation of all 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 and relief dampers.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of condensing units that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Compressor failure.
 - b. Condenser coil leak.
 - 2. Warranty Period: Five years from date of Substantial Completion.
 - 3. Warranty Period (Compressor Only): Five years from date of Substantial Completion.
 - 4. Warranty Period (Condenser Coil Only): Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PACKAGED THROUGH WALL AIR CONDITONERS (PTAC)

- A. General
 - 1. Description: Factory assembled and tested, self-contained, packaged, terminal air conditioner with room cabinet, electric refrigeration system, heating, and temperature controls; fully charged with refrigerant and filled with oil; with cord-connected or hardwired chassis.
 - 2. 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.
 - 3. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - "Ventilation Rate Procedures," and Section 7 - "Construction and Startup."
 - 4. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1.
 - 5. ASHRAE Thermal Comfort: Applicable requirements in ASHRAE 55.
 - 6. UL listed and ETL performance certified.

B. Chassis

1. Cabinet: 0.052-inch- 1.3-mm thick powder-coated steel with removable front panel with concealed latches.
 - a. Wall or floor mounting with wall sleeve or subbase as required.
 - b. Angled or Flat Top as scheduled.
 - c. Discharge grille of extruded aluminum allowing four-way discharge air pattern, tamperproof, and carrying a flame test rating in accordance with UL standard 494.
 - d. Louvers: Extruded aluminum with enamel finish; color selected by Architect from no less than 16 manufacturer's standard and premium colors.
 - e. Finish: Baked enamel, color selected by Architect.
 - f. Access Door: Hinged door in top of cabinet for access to controls.
 - g. Cabinet Extension: Where scheduled or shown, matching cabinet in construction and finish, allowing diversion of airflow to adjoining room; with grille.
 - h. Finish of Interior Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
 - i. Hydronic Subbase: Enameled steel with six adjustable leveling feet and adjustable end plates with two-row NPS 5/8 (DN 18) copper tube, aluminum-plate finned coil for use with hot water or steam, normally open low-voltage electric valve for hot water and provision for mounting receptacle, with factory-installed and -wired, fused disconnect switch and receptacle sized for unit.
 - j. Wall Sleeves: Galvanized steel with powder-coated paint.
2. Fans:
 - a. Indoor and outdoor fans with separate motors.
 - b. Indoor Fan: Forward curved, centrifugal; with two or three speed motor as scheduled.
 - c. Outdoor fan: Forward curved, centrifugal, or propeller type with one or two speed motor as scheduled.
 - d. Motors comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - 1) Permanently lubricated split capacitor.
 - 2) 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.
 - 3) Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.
3. Filters: Washable polyurethane in molded plastic frame.
4. Condensate Drain: Drain pan to direct condensate to outdoor coil for re-evaporation and piping to direct condensate to building waste and vent piping.
 - a. Comply with ASHRAE 62.1 for drain pan construction and connections.

- C. Refrigeration System: Direct-expansion indoor coil with capillary restrictor and hermetically sealed scroll compressor with vibration isolation and overload protection.
 - 1. Indoor and Outdoor Coils: Seamless copper tubes mechanically expanded into aluminum fins with capillary tube distributor on indoor coil.
 - 2. Accumulator.
 - 3. Constant-pressure expansion valve.
 - 4. Reversing valve.
 - 5. Charge: full, R-410A.

- D. Auxiliary Heating
 - 1. Electric-Resistance Heating Coil: Nickel-chromium-wire, electric-resistance heating elements with contactor and high-temperature-limit switch.

- E. Controls
 - 1. Control Module: Unit-mounted digital panel with touchpad temperature control and with touchpad for heating, cooling, and fan operation. Include the following features:
 - a. Heat-Pump Ambient Control: Field-adjustable switch changes to heat-pump heating operation above 40 deg F (5 deg C) and to supplemental heating below plus 25 deg F (minus 4 deg C).
 - b. Temperature-Limit Control: Prevents occupant from exceeding preset setback or setup temperature.
 - c. Building Automation System Interface: Allows remote on-off control with setback temperature control.
 - d. Reverse-Cycle Defrost: Solid-state sensor monitors frost buildup on both coils and reverses unit to melt frost.
 - 2. Outdoor Air: Motorized intake damper.

- F. SOURCE QUALITY CONTROL
 - 1. Sound-Power Level Ratings: Factory test to comply with AHRI 300, "Sound Rating and Sound Transmission Loss of Packaged Terminal Equipment."
 - 2. Unit Performance Ratings: Factory test to comply with AHRI 310/380/CSA C744, "Packaged Terminal Air-Conditioners and Heat Pumps."

2.2 SPLIT-SYSTEM AIR-CONDITIONERS

- A. Indoor Units (5 Tons Or Less)
 - 1. Wall-Mounted, Evaporator-Fan Components:

CONTRACT No. 20-501
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

2. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.
 3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
 4. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements; with refractory ceramic support bushings, automatic-reset thermal cutout, built-in magnetic contactors, manual-reset thermal cutout, airflow proving device, and one-time fuses in terminal box for overcurrent protection.
 5. Fan: Direct drive, centrifugal.
 6. Fan Motors:
 - a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
 - c. Enclosure Type: Totally enclosed, fan cooled.
 - d. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.
 - e. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.
 7. Air Filtration Section:
 - a. General Requirements for Air Filtration Section:
 - 1) Comply with NFPA 90A.
 - 2) Minimum MERV according to ASHRAE 52.2.
 - 3) Filter-Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.
 - b. Disposable Panel Filters:
 - 1) Factory-fabricated, viscous-coated, flat-panel type.
- B. OUTDOOR UNITS (5 TONS (18 Kw) OR LESS)
1. Air-Cooled, Compressor-Condenser Components:
 2. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
 3. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
 - a. Compressor Type: Scroll.
 - b. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
 - c. Refrigerant: R-410A.

- d. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.
4. Heat-Pump Components: Reversing valve and low-temperature-air cutoff thermostat.
5. Fan: Aluminum-propeller type, directly connected to motor.
6. Motor: Permanently lubricated, with integral thermal-overload protection.
7. Low Ambient Kit: Permits operation down to 45 deg F.
8. Mounting Base: Polyethylene.

2.3 ACCESSORIES

- A. Control equipment and sequence of operation are specified in Section 230923 "Direct Digital Control (DDC) System for HVAC" and Section 230993.11 "Sequence of Operations for HVAC DDC."
- B. Thermostat: Low voltage with subbase to control compressor and evaporator fan.
- C. Thermostat: Wireless infrared functioning to remotely control compressor and evaporator fan, with the following features:
 1. Compressor time delay.
 2. 24-hour time control of system stop and start.
 3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
 4. Fan-speed selection including auto setting.
- D. Automatic-reset timer to prevent rapid cycling of compressor.
- E. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.
- F. Drain Hose: For condensate.
- G. Monitoring:
 1. Monitor constant and variable motor loads.
 2. Monitor variable-frequency-drive operation.
 3. Monitor economizer cycle.
 4. Monitor cooling load.
 5. Monitor air distribution static pressure and ventilation air volumes.

2.4 FAN-COIL UNITS

- 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. Mitsubishi
 2. Environmental Technologies, Inc.

CONTRACT No. 20-501
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

3. McQuay International.
 4. Trane.
 5. YORK International Corporation.
 6. Carrier
- B. Description: Factory-packaged and -tested units rated according to ARI 440, ASHRAE 33, and UL 1995.
- C. Coil Section Insulation: 1-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.
- D. Main and Auxiliary Drain Pans: Stainless steel. Fabricate pans and drain connections to comply with ASHRAE 62.1
- E. Chassis: Galvanized steel where exposed to moisture. Floor-mounting units shall have leveling screws.
- F. Cabinet: Steel with baked-enamel finish in manufacturer's standard paint color as selected by Architect.
1. Vertical Unit Front Panels: Removable, steel with discharge grille and channel-formed edges, cam fasteners, and insulation on back of panel.
 2. Horizontal Unit Bottom Panels: Fastened to unit with cam fasteners and hinge and attached with safety chain; with integral stamped discharge grilles.
 3. Steel recessing flanges for recessing fan-coil units into ceiling or wall.
- G. 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 3 MERV.
 2. Glass Fiber Treated with Adhesive: 80 percent arrestance and 5 MERV.
 3. Pleated Cotton-Polyester Media: 90 percent arrestance and 7 MERV.
- H. Electric-Resistance Heating Coils: Nickel-chromium heating wire, free of expansion noise and hum, mounted in ceramic inserts in a galvanized-steel housing; with fuses in terminal box for overcurrent protection and limit controls for high-temperature protection. Terminate elements in stainless-steel machine-staked terminals secured with stainless-steel hardware.
- I. Fan and Motor Board: Removable.
1. Size / design for mid-life filter resistance equal to the average of the as specified clean filter resistance at the design flowrate and the filter manufacturer's recommended maximum (in need of changing) filter resistance at the design flow rate.

CONTRACT No. 20-501
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

2. Fan: Forward curved, double width, centrifugal; directly connected to motor. Thermoplastic or painted-steel wheels, and aluminum, painted-steel, or galvanized-steel fan scrolls.
 3. Motor: Permanently lubricated, multispeed; resiliently mounted on motor board. Comply with requirements in Division 23 Section "Common Electrical Requirements for HVAC Equipment."
 4. Wiring Termination: Connect motor to chassis wiring with plug connection.
 5. Two or Three-way, modulating control valve for dual-temperature coil.
 6. Hose Kits: Minimum 400-psig working pressure, and operating temperatures from 33 to 211 deg F. Tag hose kits to equipment designations.
 - a. Length: 24 inches
 - b. Minimum Diameter: Equal to fan-coil-unit connection size.
 7. Two-Piece Ball Valves: Bronze body with full-port, chrome-plated bronze ball; PTFE or TFE seats; and 600-psig minimum CWP rating and blowout-proof stem.
 8. Automatic Flow-Control Valve: Brass or ferrous-metal body; 300-psig working pressure at 250 deg F, with removable, corrosion-resistant, tamperproof, self-cleaning piston spring; factory set to maintain constant indicated flow with plus or minus 10 percent over differential pressure range of 2 to 80 psig.
 9. Y-Pattern Hydronic Strainers: Cast-iron body (ASTM A 126, Class B); 125-psig working pressure; with threaded connections, bolted cover, perforated stainless-steel basket, and bottom drain connection. Include minimum NPS 1/2 hose-end, full-port, ball-type blowdown valve in drain connection.
 10. Wrought-Copper Unions: ASME B16.22.
- J. Control devices and operational sequences are specified in Division 23 Sections "Instrumentation and Control for HVAC".
- K. Electrical Connection: Factory wire motors for a single electrical connection. Provide factory mounted unit disconnect.

2.5 PROPELLER UNIT HEATERS

- 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. Airtherm; a Mestek Company.
 2. Mitsubishi (basis of design)
 3. Engineered Air Ltd.
 4. McQuay International.
 5. Rosemex Products.

CONTRACT No. 20-501
DIVISION 23 – HEATING, VENTILATION, AIR CONDITIONING

6. Ruffneck Heaters; a division of Lexa Corporation.
 7. Trane
- B. Description: An assembly including casing, coil, fan, and motor in horizontal discharge configuration with adjustable discharge louvers.
- C. Comply with UL 2021.
- D. Cabinet: Removable panels for maintenance access to controls.
- E. Cabinet Finish: Manufacturer's standard baked enamel applied to factory-assembled and -tested propeller unit heater before shipping.
- F. Discharge Louver: Adjustable fin diffuser for horizontal units and conical diffuser for vertical units.
- G. Electric-Resistance Heating Elements: Nickel-chromium heating wire, free from expansion noise and 60-Hz hum, embedded in magnesium oxide refractory and sealed in steel or corrosion-resistant metallic sheath with fins no closer than 0.16 inch. Element ends shall be enclosed in terminal box. Fin surface temperature shall not exceed 550 deg F at any point during normal operation.
1. Circuit Protection: One-time fuses in terminal box for overcurrent protection and limit controls for high-temperature protection of heaters.
 2. Wiring Terminations: Stainless-steel or corrosion-resistant material.
- H. Fan: Propeller type with aluminum wheel directly mounted on motor shaft in the fan venturi.
- I. Fan Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
- J. Motor Type: Permanently lubricated multispeed or variable speed.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive equipment 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 unit installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 INSTALLATION

- A. Install equipment in compliance with NFPA 90A.
- B. Install equipment level and plumb.
- C. Suspend motorized equipment from structure with threaded steel rods and minimum 0.25-inch static-deflection, elastomeric vibration isolation hanger. Vibration isolators are specified in Section 23 05 48 "Mechanical Sound, Vibration, and Seismic Control."

3.3 FREEZE-PROTECTION

- A. Take all precautions to prevent uncontrolled infiltration of outdoor air to coils and piping, including (but not necessarily limited to) following preventative steps:
- B. Provide sleeves, safing, insulation, caulking, etc..., as required to make neat and airtight connection to outside air intakes, with no uncontrolled infiltration permitted.
- C. If walls are in such condition that it is impossible to plumb the units with the walls and get correct sealing through standard methods, notify the Owner and Architect of proposed solution, and modify methods as required. Units must seal tightly against the walls and prevent infiltration.
- D. Insure that adapter back wall boxes are properly installed and sealed and that no air is permitted to leak past them. Insulate per section 23 07 00 – HVAC Insulation.
- E. Adjust outdoor air dampers on the units to close tightly when in the unoccupied position (100% closed).
 - 1. Operate electric heating elements through each stage to verify proper operation and electrical connections.
 - 2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
- F. After installing equipment, inspect for damage to finish. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.
- G. Remove and replace malfunctioning and damaged units and retest as specified above.

END OF SECTION 23 82 00

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SECTION 26 01 26 – TESTING

PART 1 - GENERAL

1.1 SUMMARY

- A. The Contractor shall perform all tests as specified in these specifications, and as required on the drawings.
- B. Individual testing requirements are detailed in the individual equipment specifications.
- C. Related Sections:
 - 1. Section 26 24 16 Panelboards
 - 2. Section 26 05 19 Wires and Cables (600V maximum)

1.2 PERFORMANCE REQUIREMENTS

- A. General
 - 1. The Contractor shall furnish all instruments and qualified personnel for all tests.
 - 2. Written notice of all tests shall be given to the Engineer at least two (2) weeks in advance.
 - 3. Unless waived in writing by the Engineer, all tests shall be made in the presence of a duly authorized representative of the Engineer. When the presence of such representative is so waived, sworn statements, in duplicate, of the tests made and the results thereof, shall be furnished to the Engineer by the Contractor.
 - 4. Necessary adjustments and testing shall be made in cooperation with the respective manufacturers.
- B. Factory and witness shop testing requirements shall be as detailed in the individual equipment specifications.
- C. Field Testing: All electrical equipment furnished, installed, or modified under this Contract shall be field tested by the Contractor as detailed in the individual equipment specifications.
- D. Schedules and Park Operations
 - 1. When testing requires that certain pieces of equipment be taken out of service, all testing procedures and schedules must be submitted to the County's engineer for review and approval one month prior to any work beginning. When testing has been scheduled as above, the park must be notified 48 hours prior to any work to allow time for load switching and/or alternation of equipment. In addition, all testing that requires temporary shutdown of park equipment must be coordinated with park personnel so as not to affect proper park operations.
 - 2. At the end of the workday, all equipment shall be back in place and ready for immediate use should a park emergency arise. In addition, should an emergency condition occur during testing, at the request of the park engineer, the equipment shall be placed back in service immediately and turned over to park personnel.

CONTRACT No. 22-523
DIVISION 26 - ELECTRICAL

3. In the event of accidental shutdown of park equipment, the Contractor shall notify park personnel immediately to allow for an orderly restart of affected equipment.

E. Final Field Testing

1. Before each test commences, the Contractor shall submit a detailed test procedure, and also provide manpower and scheduling for the approval of the Engineer.

1.3 SUBMITTALS

- A. Submit the following in accordance with Article 4 of the General Conditions and Division 1.

B. Certificate of Compliance

1. Qualifications of independent testing firm and technicians.

C. Reports

1. Proposed testing methods and schedules shall be submitted for review and approval prior to testing
2. All field test reports shall be submitted for record. Test reports shall include pass/fail criteria for all tests performed.

1.4 REFERENCES

- A. NETA – International Electrical Testing Association.
B. IEEE – Institute of Electrical and Electronics Engineers.
C. ANSI – American National Standards Institute.
D. NICET -National Institute for Certification in Engineering Technologies
E. OSHA- Occupational Safety and Health Act

1.5 QUALITY ASSURANCE

A. Testing:

1. An independent qualified testing firm shall be employed, employing NETA certified technicians.
2. The testing firm shall be a corporately and financially independent testing organization which can function as an unbiased testing authority, professionally independent of the manufacturers, suppliers, and installers of equipment or systems evaluated by the testing firm.
3. The testing firm shall be regularly engaged in the testing of electrical equipment devices, installations, and systems.
4. The testing firm shall meet OSHA criteria for accreditation of testing laboratories, Title 29, Part 1907, or be a Full Member company of the International Electrical Testing Association.

CONTRACT No. 22-523
DIVISION 26 - ELECTRICAL

5. The lead, on site, technical person shall be currently certified by the International Electrical Testing Association (NETA) or National Institute for Certification in Engineering Technologies (NICET) in electrical power distribution system testing.
6. The testing firm shall utilize engineers and technicians who are regularly employed by the firm for testing services. Resumes of key staff proposed for the project shall be submitted to the Engineer for review.
7. The testing firm shall submit proof of the above qualifications with bid documents, when requested.
8. The terms used here within, such as test agency, test Firm, testing laboratory, or Contractor's test company shall be construed to mean the testing firm.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

-END OF SECTION-

- NO TEXT ON THIS PAGE -

SECTION 26 05 01 – ELECTRICAL - GENERAL PROVISIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. General Electrical Requirements shall be provided in accordance with the requirements specified under this section, the Specifications, and the Contract Drawings.
2. The Contractor shall provide all labor, materials and equipment required to perform the work as specified in the Specifications and shown on the Contract Drawings.
3. The existing park must be maintained in continuous operation during the entire construction period of this contract. Work under this contract shall be so scheduled and conducted by the Contractor that such work will not impede any park operations, reduce the quality of the guests' experiences, or cause other nuisances. In performing the work shown and specified, the Contractor shall plan and schedule his work to meet the parks operating requirements.
4. The Contractor has the option of providing additional temporary facilities that can eliminate a constraint, provided it is done at no additional cost and provided that all requirements of these specifications are fulfilled. No park personnel will be available to supervise, operate or maintain any temporary facilities. Work not specifically covered herein may, in general, be done at any time during the contract period, subject to the operating requirements outlined hereinafter. All references to days in this section are to be considered consecutive calendar days, except where noted. All references to schedule completion dates shall mean the date noted in the latest revision of the CPM schedule.

B. Related Sections:

1. Section 09 90 00 - Painting
2. Section 26 01 26 - Testing

1.2 SUBMITTALS

- A. Contractor shall submit working drawings, shop drawings and material specifications for the approval of the Engineer in accordance with the requirements of the General Conditions, Article 4 - Contractor's Working Drawings, Design and Shop Drawings; and as specified under Division 1 of the Specifications.
- B. Reports: Demonstration of equipment report shall be submitted.

1.3 REFERENCES

- A. General electrical requirements shall comply with the latest applicable provisions and recommendations of the following:
 1. NFPA 70, National Electrical Code.

2. NFPA 70E, Standard for Electrical Safety in the Workplace
3. NFPA 101, Life Safety Code
4. NEMA, National Electrical Manufacturers Association.
5. UL, Underwriters Laboratories Incorporated.
6. OSHA 1910 Subpart S, Electrical

1.4 QUALITY ASSURANCE

A. General:

1. All equipment and devices, provided under this Contract, shall be properly connected, and interconnected with other equipment and devices of other trades under this Contract so as to render the installations complete for successful operation, regardless of whether all the connections and interconnections are specifically mentioned in the Specifications or shown on the Contract Drawings.
2. Similar products shall be by the same manufacturer for uniformity on the Contract.
3. Electrical material and equipment shall be new and shall bear the label of UL, or other nationally recognized, independent testing laboratory, wherever standards have been established and label service regularly applies.
4. Where execution of the work under this Contract requires certain systems and equipment to be modified, the Contractor shall perform the work with due regard to maintenance of operations and construction staging in accordance with the Specifications.
5. The modification work shall be coordinated in advance with the park superintendent and existing conditions. Contractor shall field determine and make such investigations as required to determine the functionality of each circuit and identify circuit terminations as required for the modifications intended to ensure the proper interface of all components for a complete functional system.
6. The locations and requirements shall be in accordance with the following:
 - a. Materials, equipment, and incidentals installed in outdoor or wet areas shall meet NEC and NEMA requirements for wet locations. Enclosures installed in outdoor and wet locations shall meet NEMA 3R requirements except where the drawings indicate NEAM 4X is required.
 - b. Materials, equipment, and incidentals installed in indoor locations shall meet NEC and NEMA 12 requirements.

1.5 GENERAL CONSTRAINTS

A. General:

1. Under paragraph 1.6, Sequence of Construction and Operation, herein, the sequence for units which are to be taken out of service for renovation and remedial work is outlined for each area. The operational status of completed or existing units other than the designated units shall not be interrupted by the Contractor. New units may only be used after the specified testing and acceptance of the units.

B. Accidental Shutdown

1. In the event of accidental shutdown of park equipment, the Contractor shall notify park personnel immediately to allow for an orderly restart of affected equipment.

C. Access to Plant Site

CONTRACT No. 22-523
DIVISION 26 - ELECTRICAL

1. An unobstructed traffic route through the park must be maintained at all times for the park equipment and personnel.
- D. Internal Roads Access
1. Vehicular access to the construction areas and buildings must be maintained at all times.
- E. Personnel Access
1. Park personnel must have access to all areas which remain in operation throughout the construction period. The construction work must be phased, and access for park workers must be maintained during construction.
- F. Power, Light and Communication Systems
1. Electric power, lighting service and communications systems shall be maintained in uninterrupted operation in all areas which remain in operation. Individual units may be disconnected as required for replacement.
- G. Sump Pumps and Sumps
1. All existing pumps shall be maintained in an operable condition with either existing pumps or temporary pumps. Interim piping, power and controls shall be provided as required by the staged construction sequence.
- H. Service Interruptions
1. When a construction task requires a suspension of normal operations of a park utility system for a period of less than twenty-four (24) continuous hours, the suspension shall be considered a service interruption.
 2. The contractor shall compile an inventory of the labor and materials required to perform the tasks, an estimate of the time required, and a written description of the steps required to complete the task resulting in a service interruption. The inventory, time estimate, and written procedure shall be submitted to the Engineer for review sixty (60) days prior to the start date of the task as defined in the CPM schedule. If the proposed procedure submitted by the Contractor is acceptable, the Engineer shall authorize in writing, the service interruption pending the verification of materials and labor and the final notification specified therein.
 3. No service interruption shall be initiated until the list of materials and labor is verified by the Engineer as on site at least one week prior to the proposed start date. After verification of the list of materials and labor, the Contractor shall notify the Engineer of the exact date that he wishes to perform the work in writing two (2) normal working days, excluding Saturdays, Sundays, and holidays, prior to the proposed date.
 4. When the normal operations of a park utility system unit are suspended longer than twenty-four (24) hours, then the procedures for a shutdown, specified hereinafter, shall be enforced.

1.6 SEQUENCE OF CONSTRUCTION AND OPERATION

- A. In order to maintain continuous park operation during construction, a phased removal, construction, and operational sequence will be required as described herein. The order in which the principal structures or work areas are presented herein is for convenience of presentation and is not intended as a sequence of work or a listing of priorities. The

Contractor is advised that work in multiple areas of the park must be performed simultaneously in order to complete the entire scope of the contract within the allotted time. All Contractors are advised that the presentation is not organized in accordance with specific trades.

1.7 TEMPORARY FACILITIES

- A. Temporary facilities shall be provided in accordance with the requirements of Division 1, GENERAL REQUIREMENTS.
- B. Temporary facilities shall be any equipment, materials, controls, services, and accessories temporarily needed for access to and for protection of all existing structures and equipment, and to maintain an operating system in accordance with the provisions of the specifications.
- C. The size or capacity of the temporary facility shall generally be equal to the size or capacity of the facility replaced, unless otherwise directed by the Engineer.

1.8 INTERIM AND TEMPORARY MATERIAL AND EQUIPMENT

- A. The Contractor shall furnish, install, and remove the interim material and equipment in accordance with the Contract Documents.
- B. The Contractor is responsible for the removal from the site of all interim material and equipment and disposal thereof in accordance with the Specifications.
- C. Temporary material and equipment is material and equipment which must be furnished by the Contractor based on its method of construction for maintaining a treatment process for a specific period, or the utility or service systems during the installation or connection of new equipment or material. For specific cases, the location and general routing of temporary equipment and material has been shown for the convenience of the Contractor and to ensure minimal disruption of parks operations during the equipment installation. The Contractor is advised that temporary connection between the existing and new service shall be necessary to comply with the General Constraints specified herein.

1.9 ADDITIONAL PROVISIONS

- A. Shutdowns:
 - 1. Prior to commencing work on any existing equipment which requires a shutdown or suspension of normal operations, the Contractor shall request permission from the Engineer, in writing, at least sixty (60) days in advance of the date he proposes to commence such work. Simply furnishing a date in a CPM schedule without explicit notification to the Engineer shall not constitute proper notification. In the request, the Contractor shall explain what construction procedures shall be used during the shutdown.
 - 2. The Contractor is prohibited from shutting down any equipment before obtaining written authorization from the Engineer to proceed with such operations; such authorization shall, however, not be construed as a waiver of the requirements for the uninterrupted operation of the park. A final notification in writing shall be submitted by the Contractor two (2) normal working days excluding Saturdays, Sundays, and holidays, in advance of the actual shutdown.

B. Protection of Underground and Covered Facilities:

1. The location and extent of these facilities are not guaranteed, and the Contractor is cautioned to proceed with care, in the construction of new work in order to prevent damage to any existing structures, piping, or facilities. Protection and support for all underground facilities shall be provided to ensure that the service provided for all existing facilities will not be interrupted. Any rerouting of existing facilities to facilitate construction operation shall be only with written permission of the Engineer; and then in the manner and at the time approved by the Engineer. The rerouting shall be made at no additional cost.

C. Special Protection of Machinery and Equipment:

1. The Contractor shall take all protective measures to the satisfaction of the Engineer necessary to ensure that inclement weather or dust and debris from demolition does not enter any of the mechanical or electrical equipment enclosures. Enclosures shall be provided where necessary to prevent contamination of the air. All protective measures shall be furnished, installed, lighted, ventilated, maintained, and removed at the Contractor's own cost.
2. Interior dustproof covers shall be a heavy reinforced polyethylene film curtain, minimum thickness 6 mils, supported by wood framing. All seams and penetrations shall be sealed with duct tape on two sides. Junctions with existing walls, floors and ceilings shall be made with a double fold secured with a backing strip anchored to the existing wall, floor, and ceiling.
3. Exterior weather tight enclosures shall be provided whenever a section of a roof or exterior wall on an existing building is removed, or equipment is installed in a new building.

D. Site Visit

1. The Contractor, before submitting its proposal, shall visit the site and shall be responsible for having ascertained local conditions, such as location, accessibility and general character of the site, the character and extent of any existing work within or adjacent to the site, and any other work being performed on the site at the time of submitting a proposal. The Contractor shall fully examine all the drawings relating to the work and shall become completely informed as to the extent and character of the work required and prevailing existing condition. No allowances will be made for the Contractor's failure to avail itself of such information.

E. Existing Cables and Conduits

1. It is anticipated that several branch circuit conduits and/or lights may have to be routed, extended, relocated, or temporarily removed and replaced, to permit the installation or removal of equipment as part of this work. Review all drawings and allow for the rerouting or relocation of wiring systems and devices to remain which must be relocated or rerouted. The Contractor shall allow for and accomplish these rework items to suit field requirements and conditions.
2. When working with existing equipment or wiring systems care shall be taken to avoid damage, and shutdown of process equipment. Prior to working in an area, the Contractor shall examine existing conditions and file an inspection report with the Engineer. Any additional defects which result from the Contractor's work, will result in the Contractor being held liable for damage to existing equipment.
3. Where new construction involves connecting to or using existing equipment, the Contractor shall include all work and materials required to adapt, extend, or rework

the prevailing existing condition, to the new work. Should an existing condition prove to be grossly deteriorated or inadequate for modification, such condition shall be reported to the County and the Engineer for a remedy.

4. Where existing empty conduits are to be used for new wiring systems, they shall be assumed to be in poor condition requiring prior "make ready" work before using. A wire brush reamer shall be pulled through prior to wiring and, if necessary, water accumulations shall be pumped or blown out.
 5. Contractor shall trace and tag all wires before these are relocated and reconnected to the equipment. Contractor shall coordinate removal of wires with the Field Engineer.
 6. As indicated on the plans, certain equipment and/or wiring systems are being taken out of active service permanently and the Contractor shall perform all work required to remove or safely abandon existing systems.
 7. The following describes the intended work scope for removals:
 - a. The Contractor shall arrange for the safe de-energization of all electrical equipment to be removed as part of this Contract.
 - b. Feeder and branch wiring, conduits and boxes routed exposed shall be removed in their entirety by the Contractor.
 - c. Feeder and branch wiring and conduits in earth, concrete slabs or masonry shall be abandoned in place, except that wiring ends shall be cut off (or removed) at the conduit mouth by the Contractor. When feeder and branch wiring and conduits interfere with the installation of any new project work, they shall be removed in their entirety by the Electrical Contractor. Conduits which exit floor slabs, and walls, shall be cut or hammered down flush with floor level or wall and filled with epoxy concrete by the Contractor.
 8. Generally, all removed equipment, boxes, fixtures, etc. shall be removed from the site and disposed of at Contractor's expense. Equipment specifically identified to be turned over to the County for use as spare, shall be packaged, labeled, and stored to prevent damage to equipment until directed to turn over to the County. Contractor shall relocate said equipment to a permanent on-site storage area as directed by the County at no extra cost to the County.
 9. The Contractor shall be responsible for all damage to existing structures, equipment, and facilities caused by its construction operations and must repair all such damage when and as ordered at no additional cost.
- F. Emergency Repair Crews:
1. In case the Contractor's operations disrupt the treatment process or the minimum operating facilities herein before described, at any time, it shall at its own cost immediately make all repairs or replacements and do all work necessary to restore the plant to operation to the satisfaction of the Engineer. Such work shall progress continuously to completion on a 24-hour a day, seven work-day a week basis. The Contractor shall provide the services of emergency repair crews, available on call 24 hours per day.

PART 2 - PRODUCTS

2.1 SHOP FINISHES

- A. Electrical equipment shall be shop painted in accordance with the requirements of Section 09 90 00 - Painting.
- B. Exposed ferrous metal surfaces except aluminum, bronze, brass, and stainless-steel components shall be cleaned with a commercial blast and primed with one coat of rust inhibitive primer.
- C. Manufactured assemblies such as panelboards and motor controllers shall be shop painted in accordance with the requirements of Section 09 90 00 - Painting.
- D. Other equipment shall be painted with the manufacturer's best grade finish paint system compatible with the finish coatings specified in Section 09 90 00 - Painting.

PART 3 - EXECUTION

3.1 MAINTENANCE OF OPERATIONS

- A. Where execution of the work under this Contract requires certain equipment to be taken out of service, the Contractor shall perform the work with due regard to maintenance of operations and construction staging in accordance with the Contract Specifications.
- B. The Contractor shall schedule the work in advance with the Engineer so as not to affect proper park operations. When the work is scheduled, the Engineer shall be notified 48 hours prior to proceeding with the work to allow time for the park superintendent to perform load switching and alternation of equipment.
- C. To the maximum extent possible at the end of the workday, all equipment shall be back in place and ready for its normal service use should a park emergency arise. In addition, should an emergency condition occur during execution of the work, at the request of the park engineer, the equipment shall be placed back in service immediately and turned over to park personnel.
- D. In the event of accidental shutdown of park equipment, the Contractor shall notify park personnel immediately to allow for an orderly restart of affected equipment.

3.2 DEMONSTRATION OF EQUIPMENT

- A. The Contractor shall demonstrate that, in the presence of the Engineer, all electrical systems and electrically operated equipment operates as specified, designed, and as required.
- B. The demonstration of equipment shall include the following:
 - 1. All power circuits shall be operated to verify proper connection to equipment. Mechanical key-interlocks for circuit breakers shall be operated to verify their proper operation. Power shall be removed and reapplied to automatic transfer switches to verify their operation.

CONTRACT No. 22-523
DIVISION 26 - ELECTRICAL

2. Emergency power systems shall be activated to verify their automatic start-up, proper operation while running and proper de-energization and cool down upon availability of normal power.
 3. All pushbuttons, indicating lights and similar devices shall be operated to verify proper connection and function. All devices, such as pressure and flow switches and similar devices shall be operated to verify that shutdowns and control sequences operate as required.
 4. The Contractor shall operate the systems to verify wiring and adjust the controls, as required, to achieve proper operation. This shall include wiring, timing, and switching functions.
- C. The Contractor shall provide a demonstration of equipment report. The report shall include complete information on time, schedule, tasks performed, persons contacted, problems corrected, and all other pertinent information.

3.3 RESTORATION

- A. The Contractor shall field paint after installation marred or scratched surfaces. All scratches, abrasions and other damage to equipment shall be touch-up painted in accordance with the requirements of Section 09 90 00 - Painting.

-END OF SECTION-

SECTION 26 05 05 – DEMOLITION, ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Requirements for providing demolition work. This section also includes equipment relocation. The demolition and relocation work shall be performed in accordance with the requirements specified under this Section, the Contract Specifications, and the Contract Drawings.
2. The Contractor shall remove and dispose of all electrical equipment and items as a result of the demolition Work. Where demolished equipment is so identified, it shall become the property of the County and disposal shall not occur.
3. The Contractor shall also relocate electrical equipment. The extent of the demolition and relocation work is shown on the Contract Drawings.

1.2 PERFORMANCE REQUIREMENTS

A. Scheduling

1. The Contractor shall proceed with the demolition and removal of equipment in a sequence designed to maintain the existing park in operation. The Contractor shall notify the Engineer 48 hours before proceeding and meet with park personnel to review removals and demolition work. Work shall begin only after approval of the County and Engineer.
2. Any equipment and appurtenances removed without proper authorization, which are necessary for the operation of the existing park, shall be replaced to the satisfaction of the Engineer at no additional cost.
3. The Contractor shall familiarize himself with the work of all disciplines and coordinate and schedule demolition activities with the other disciplines for proper sequencing of the work and the removal of equipment.

1.3 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited, to:

1. Techniques and details proposed to accomplish the demolition work.

1.4 REFERENCES

A. Demolition work shall comply with the latest applicable provisions and recommendations of the following:

CONTRACT No. 22-523
DIVISION 26 - ELECTRICAL

- | | | |
|----|-----------|-------------------------------------------------|
| 1. | NYSCC | New York State Construction Code |
| 2. | NFPA 70 | National Electrical Code. |
| 3. | NFPA 70E | Standard for Electrical Safety in the Workplace |
| 4. | NFPA 101 | Life Safety Code. |
| 5. | OSHA 1910 | Subpart S - Electrical. |

1.5 QUALITY ASSURANCE

- A. All demolition and removal work shall be in accordance with the New York State Building Code and Electrical Code.
- B. In performance of the demolition work, the Contractor shall provide protection of adjacent plant areas, existing equipment, and on-going construction. No electrical equipment shall be disposed off-site without the written approval of the County and Engineer.
- C. The Contractor shall execute the work in a careful and safe manner with the least possible disturbance to the public and to the operation of the park. All work shall be performed with due regard to maintenance of plant operations and construction staging in accordance with the Contract Specifications.
- D. Demolition and removal work shall be executed with care and performed by competent experienced workers for the various types of demolition and removal work. All patching, replacing, and refinishing of work shall be done by skilled workers. The work shall be carried out through to completion with due regard to the safety of County employees, park employees, workers on site and the public.
- E. The Contractor shall make such investigations, explorations and probes as are necessary to ascertain any required protective measures before proceeding with demolition and removal. The Contractor shall give particular attention to shoring, bracing, and shielding requirements so as to prevent any damage to new or existing construction. The Contractor shall be responsible for any damage which may be caused by demolition and removal work to any part or parts of existing structures or equipment designated for reuse or to remain.
- F. All demolished equipment becomes the property of the Contractor, except where identified by the County. All equipment marked by the County or park employees to remain shall be carefully removed by the Contractor, so as not to be damaged, cleaned and stored on or adjacent to the site in a protected place or loaded onto trucks provided by the County.
- G. The Contractor shall coordinate with other disciplines to disconnect or remove sources of power to equipment being removed or relocated under other disciplines.

1.6 SITE CONDITIONS

- A. The County assumes no responsibility for the actual condition of structures to be demolished and removed. Conditions existing at the time of inspection for bidding purposes shall be noted by the Contractor and shall be used by him in preparing his bid.
- B. The Contractor shall perform the work with due regard that certain equipment, tanks, and piping contain gases which are potentially hazardous and may be toxic, contain insufficient oxygen for human survival and are combustible in the presence of oxygen. All work regarding hazardous materials shall be performed in accordance with the Contract Specifications and the Health and Safety Plan Requirements.

- C. The Contractor shall perform the work with due regard that in some areas only certain systems and equipment shall be demolished while other systems and equipment shall remain operational. Contractor shall field determine and make such investigations as required to determine the source and function of each circuit, to allow for the disconnection and removal each circuit not required as result of the demolition and to retain all active circuits for areas unaffected by the demolition work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PREPARATION

- A. The Contractor shall provide protection and restoration of structures in accordance with the Contract Specifications. Catch platforms, lights, barriers, weather protection, warning signs and other items shall be provided as required for proper protection of the public, occupants of the building, workers engaged in demolition operations, and adjacent construction.
- B. The Contractor shall provide weather protection at exterior openings so as to fully protect the interior premises against damage from the elements until such openings are closed by new construction.
- C. The Contractor shall provide temporary protection of the existing structure designated to remain where demolition, removal and new work is being done, connections made, materials handled, or equipment moved.
- D. The Contractor shall provide dustproof partitions to prevent dust from rising by wetting demolished masonry, concrete, plaster, and similar debris. Unaltered portions of the existing equipment affected by the demolition shall be protected. Such enclosures will be required in areas of major demolition work and for protection of existing equipment and personnel. Insulating barriers shall also be provided where necessary for protection.
 - 1. Dust proof partitions shall be constructed of wood studs with plywood on both sides. Partitions shall extend from floor to ceiling with a closure plate at the floor and ceiling and a dust-tight door in each enclosure complete with hardware, attached and keyed.
 - 2. Insulation barriers shall be provided to cover exposed, energized terminals, wires and busses.
 - 3. Adequate ventilation shall be provided for a safe working environment.
- E. The Contractor shall provide adequate fire protection during demolition in accordance with County Fire Department requirements.
- F. The Contractor shall not close or obstruct roadways, walkways, passageways, or stairways and shall not store or place materials in passageways, stairs, or other means of egress. The Contractor shall conduct operations with minimum traffic interference.
- G. The Contractor shall repair any damage to the existing structure or contents by reason of the insufficiency of protection provided.

3.2 REMOVALS

- A. The Contractor shall demolish or relocate electrical equipment as shown on the Contract Drawings. All motors shall be disconnected by the Contractor and removed with the driven equipment.
- B. All wiring shall be removed, salvaged, and stored. Direct burial cable shall be abandoned, but disconnected at both ends, insulated, and identified. Where cable enters a structure, the cable shall be cut back to the point of entrance.
- C. All exposed conduits shall be removed and disposed. Conduits underground or concealed shall be abandoned. Abandoned conduits shall be cut flush with the slab or wall at the point of entrance and plugged.
- D. Recessed equipment to be demolished shall be abandoned, unless otherwise noted on the Contract Drawings. Demolished recessed panelboards and boxes enclosure fronts and internals shall be completely removed. The enclosure fronts shall be covered with new blank cover plates.
- E. Wherever cable and conduit are to be removed for disposition, the circuit shall be de-energized by the Contractor and adjacent circuits that are to remain in service shall be blanked off and then isolated.
- F. All supports, pedestals and anchors for conduits, lighting fixtures and other equipment shall be removed with the equipment unless otherwise noted on the Contract Drawings. Concrete bases, anchor bolts and other supports shall be removed to approximately one inch below the surrounding finished area and the recesses shall be patched to match the adjacent areas.
- G. The Contractor shall dispose of all demolition equipment, debris and other items, not marked by the County to remain, off the site and in conformance with all applicable codes and regulations.
- H. The Contractor shall perform patching, restoration, finishing and new work in accordance with the Contract Specifications. All openings in structures as a result of the work, shall be patched and exterior openings made watertight. Where alterations occur, or new and old work join, the Contractor shall cut, remove, redrill, or refinish the adjacent surfaces to the extent required by the conditions, so to leave the altered work in a condition as existed prior to the start of the work.
- I. Superstructure wall and roof openings shall be closed, and damaged surfaces shall be restored to match the adjacent areas. Wall sleeves and castings shall be plugged or blanked off, all conduit openings in equipment shall be closed.
- J. Where equipment is indicated to be removed, relocated, and reused, the equipment shall be operated in the presence of representatives of the Contractor, County and Engineer. Such items shall be removed or relocated with care to prevent unnecessary damage, under the supervision of the trade responsible for reinstallation and protected and stored until required. Material or items damaged during removal shall be replaced with similar new material or items.
- K. Ballasts in each existing lighting fixture shall be assumed to contain PCB's unless specifically marked with a label indicating "No PCBs". Remove ballasts from each lighting fixture and pack them in accordance with EPA PCB regulations. Ship ballast in approved containers to an EPA approved recycling facility and pay all shipping, packaging and recycle costs.

- L. PCBs, mercury and PCB/mercury contaminated equipment shall be removed, packaged, shipped and disposed of in accordance with all State and Federal regulations. Obtain the services of a firm licensed and regularly engaged in the removal of PCBs and PCB contaminated equipment. The firm shall be licensed in the State or States in which the contaminated material is handled, shipped and disposed. Pay all fees associated with the removal of the contaminated material and equipment and provide documentation showing acceptable disposal.
- M. Should the Contractor discover PCB or mercury contaminated equipment that was not identified; they shall cease work on or about the equipment and notify the Engineer immediately. The Contractor shall then proceed with the work as directed by the Engineer.

3.3 CLEANING AND MAINTENANCE

- A. The Contractor shall maintain the existing electrical power system to operate without interruption. Any interruption of electrical power to the existing facility and equipment shall be with the approval and permission of the County and the Engineer.
- B. The Contractor shall maintain all protection facilities installed in preparation of the demolition work.
- C. The Contractor shall provide on-site dump containers for collection of waste materials, debris, and rubbish.
- D. All existing surfaces shall be cleaned of dirt, grease, loose paint before refinishing.
- E. The Contractor shall clean the site and properties of dust, dirt and debris caused by the demolition and removal work in accordance with the Contract Specifications. Waste materials, debris and rubbish shall be disposed of, and the areas shall be returned to conditions prior to start of the work.

-END OF SECTION-

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SECTION 26 05 19 – WIRES AND CABLES (600 VOLT MAXIMUM)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Requirements for providing low-voltage electric wires, cables, and accessories.
 - a. Low-voltage electric wires, cables, and accessories shall be provided in accordance with the requirements specified under this Section, the Specifications, and the Contract Drawings.
 - b. Low-voltage electric wires and cables to be provided shall include all accessories.

B. RELATED SECTIONS:

1. Section 26 05 01 – Electrical – General Provisions
2. Section 26 05 26 – Grounding System

1.2 DEFINITIONS

- A. Low voltage as used in this Section and the Specifications shall mean all equipment, conductors, insulation systems and accessories intended for operation within the 600 Volt Class.
- B. Low-voltage wires and cables shall mean all insulated electric wires and cables intended for use for power, lighting, control, instrumentation, communication, security, and alarm circuits.
- C. Low-voltage wires and cable accessories shall mean all devices and items intended to provide mechanical protection, terminate, connect, splice, insulate, tag, and manage low-voltage wires and cables.
- D. Cable is an assembly of insulated wires combined with fillers and separators in an enclosing jacket of insulating material.
- E. All references to the Electric Utility or Utility shall mean Consolidated Edison Company or the Local Electric Utility having jurisdiction.

1.3 SUBMITTALS

- A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:
 1. A list of proposed manufacturers shall be submitted with the products they produce proposed for the contract.
 2. Manufacturer's Literature, specifications and engineering data for low-voltage wires, cables and accessories including but not limited to:
 - a. Manufacturer and type of wire or cable.
 - b. Minimum insulation resistance in megaohms per 1,000 ft. at 20 degrees C.
 - c. Material, number, and size of strands composing each conductor.

- d. Conductor insulation thickness in inches with material and voltage rating.
 - e. Jacket thickness in inches.
 - f. Average outside diameter of bare conductor.
 - g. Average outside diameter of finished wire or cable and jacket material.
 - h. Weight per 1,000 ft. of finished wire or cable.
 - i. Minimum bending radius, in inches.
 - j. Minimum pulling temperatures at which cable may be pulled without damage.
 - k. Maximum pulling tensions which may be applied to the cable without damage.
 - l. Literature identifying the methods and materials which Contractor proposes to use to make splices and terminations. Submittal shall consist of manufacturer's literature evidencing compatibility of the conductor insulation and jacket of the wire or cable with the splicing or terminating materials and methods which Contractor proposes to use.
 - m. Manufacturer recommended pulling lubricants.
 - n. Qualifications of splicing and termination personnel.
3. Description of shop and field-testing methods, procedures and apparatus with calibration dates shall be submitted. Testing methods and procedures shall be submitted at least 45 days in advance prior to conformation of witness testing dates and actual testing.
 4. Qualifications of proposed testing firm to perform acceptance testing shall be submitted. Submit firm experience records at least 45 days in advance to actual testing, five recent references with phone numbers shall be submitted.
 5. Qualifications of proposed mineral-insulated metal sheath cable installer shall be submitted. Submit installer experience records with five recent completed installations with names and phone numbers.
 6. Certification from the mineral-insulated metal sheath cable manufacturer's representative that the cable installation is in accordance with the manufacturer's requirements.
- B. Reports:
1. Shop and field test reports shall be submitted.
 2. Acceptance testing report shall be submitted.

1.4 REFERENCES

- A. Low-voltage wires and cables shall comply with the latest applicable provisions and recommendations of the following:
1. NFPA 72 - National Fire Alarm Code
 2. IEEE C2 - National Electrical Safety Code.
 3. ASTM B8 - Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
 4. ASTM D69 - Standard Test Methods for Friction Tape
 5. ASTM D2301 - Standard Specification for Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape.
 6. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape.

7. ICEA S-58-679 - Standard for Control, Instrumentation and Thermocouple Extension Conductor Identification.
8. IEEE 1210 - Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable.
9. ANSI/ICEA S-95-658/NEMA WC70 - Power Cables Rated 2000 V or Less for the Distribution of Electrical Energy.
10. NEMA WC26/EEMAC 201 - Binational Wire and Cable Packing Standard.
11. UL Standard No. 44 - Thermoset-Insulated Wires and Cables.
12. UL Standard No. 83 - Thermoplastic-Insulated Wires and Cables.
13. UL Standard 486A-486B - Wire Connectors
14. NETA ATS - NETA Acceptance Testing Specifications

1.5 QUALITY ASSURANCE

A. General:

1. All low-voltage wires, cables and accessories shall be made by an approved manufacturer, and in their construction shall be employed the most improved commercial materials and processes of manufacture.
2. Only low-voltage wires, cables and accessories manufactured under high standards of production and meeting the approval of the Engineer shall be used.
3. Friction tape shall be in accordance with ASTM. D69.
4. All low-voltage wire and cable splicing and terminations shall be done by experienced cable splicers who have worked with similar wire and cable for a period of at least 5 years, using materials and procedures recommended by the wire and cable manufacturer. All splicing and terminations of low-voltage wire and cable shall be in accordance with the instructions of the low-voltage wire and cable manufacturer.
5. The low-voltage wire and cable manufacturer shall use a shop test facility that has recently calibrated testing apparatus and qualified, experienced technicians, for all shop tests. Calibration of testing apparatus shall be within one year.
6. All test equipment and instrument calibration shall be in accordance with the latest edition of the accuracy standard of the U.S. National Institute of Standards and Technology and the NETA acceptance testing specification.
7. The mineral-insulated metal sheath cable installation shall be performed by experienced mineral-insulated metal sheath cable installers who shall have been regularly engaged in the installation of mineral-insulated metal sheath cable for a minimum of the past three years.
8. The Contractor shall retain the services of the mineral-insulated metal sheath cable manufacturer's representative to certify the cable installation is in accordance with the manufacturer's requirements.

B. Field Tests:

1. Low-voltage wires and cables shall be field tested. Field testing low-voltage wires and cables shall be in accordance with the requirements specified under Article 3.4.
2. The Contractor shall retain the services of an independent testing firm who shall perform acceptance testing on the low-voltage wire and cable installation. The testing firm shall have experience in the inspection and testing of wires and cables of the type specified and shall be a member company of NETA. Provide proof of

membership or demonstrate that the standards and experience required for membership are possessed, all to the satisfaction of the Engineer. The testing shall be performed in accordance with the requirements specified under Article 3.4.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Electric wires and cables shall be delivered, stored and handled in accordance with the Contract Specifications and the manufacturer's instructions.
- B. Carefully handle all conductors to avoid kinks and damage to insulation.

1.7 WARRANTY

- A. The manufacturer shall warrant the cable against defects for a period of 20 years from date of installation and shall remove and replace defective cables at his own expense during this warranty period.

PART 2 - PRODUCTS

2.1 LOW-VOLTAGE WIRE AND CABLE

- A. Low-voltage wire and cable shall be used for all power, lighting, and lighting control system circuits. The size and quantity of low-voltage wires and cables shall be as indicated in the conduit and cable schedule. The conductor jacket shall be in accordance with color identification requirements specified under Article 3.3.
- B. Low-voltage single conductor wires for installation in conduit shall be in accordance with the following:
 - 1. Conductors shall be stranded, copper, single conductor wire conforming to ASTM B8, and B33 No. 12 AWG minimum size.
 - 2. Conductor insulation shall be flame-retardant, moisture and heat resistant thermoset rated 90 degrees C in dry locations and 75 degrees C in wet locations and listed by UL as type THWN/THWN-2 or RHW.
 - 3. THWN/THWN-2 shall be used for all indoor circuits and RHW or XHHW-2 for all underground and outdoor circuits.
 - 4. Low-voltage single conductor wires for installation in conduit shall be as manufactured by:
 - a. Southwire, Carrollton, GA.
 - b. General Cable, Highland Heights, KY
 - c. Okonite Company, New York, NY.
 - d. Or approved equal.
- C. Low-voltage cable for installation in conduit shall be in accordance with the following:
 - 1. Conductors shall be stranded, copper conforming to ASTM B8 and B33, No. 14 AWG minimum size.
 - 2. Conductor insulation shall be high heat and moisture resistant nylon jacketed over polyvinyl chloride, rated for 90 degrees C in wet and dry locations, and listed by UL as type THWN/THWN-2.

3. RHW Conductor insulation shall be moisture and flame-resistant cross-linked polyethylene, rated for 90 degrees C in dry area and suitable for underground use, and listed by UL as type RHW/RHW-2.
4. Cable conductors shall be assembled together with flame and moisture resistant filters and tape to make round.
5. Cable shall include an overall protective jacket of polyethylene compound, 45 mils minimum thickness.
6. Low-voltage cable shall be as manufactured by:
 - a. Southwire, Carrollton, GA.
 - b. General Cable, Highland Heights, KY
 - c. Belden,
 - d. Okonite Company, New York, NY.
 - e. Or approved equal.

D. ETHERNET UNSHIELDED TWISTED PAIR (UTP) CABLE

1. Ethernet cables and connectors shall be provided for a complete and working system, and as shown on the drawings. Cable for Ethernet wiring shall be UTP Cat-6 cable. Jacket color coding for cables shall be as follows:
 - a. Standard Cat-6: Yellow
 - b. Crossover cables: Red
2. Cable shall meet the following characteristics:
 - a. Category 6 UTP Cable:
 - 1) Cat-6 cable shall meet the following requirements:
 - 2) 23 AWG.
 - 3) 4 pair solid strand FEP Teflon insulation.
 - 4) 100 Ohm impedance.
 - 5) 1250 MHz frequency range.
 - 6) Min attenuation 19.9 Db.
 - 7) 100 Ohm impedance.
 - 8) Min NEXT 44.3 dB/100MHz.
 - 9) Min PS-NEXT 42.3dB.100MHz.
 - 10) Min ELFEXT 27.8dB.100MHz.
 - 11) Min PS-ELFEXT 24.8dB/100MHZ.
 - 12) Min return loss 20.1 dB/100 MHz.
 - 13) Max delay skew 45 ns.
 - 14) Max propagation delay 540 ns.
 - 15) UL listed.
 - 16) EIA/TIA compliant.
 - b. Plenum-rated cable shall have FEP insulation jacketing and FEP insulation for conductors. Non-plenum-rated cable shall have PVC insulation jacketing and polyethylene insulation for conductors. Cat-6 cable shall be Belden 1872 or equal.
3. Ethernet Patch Cables:
 - a. Pre-wired and terminated patch cables with RJ-45 connectors and lever protecting boot shall be furnished for all connections to computers, network equipment, and controller equipment except where physical conditions (i.e., length over 12 feet or conduit size) require unterminated wire to be installed. Patch cables shall be Cat-6 and shall meet the requirements of Cat-6 cable specified in this section. Straight through cables shall be wired using the

T568-B standard for both connectors. Crossover cables shall be wired using the T568-A standard for one connector and the T568-B standard for the opposite end.

4. Ethernet Connectors:
 - a. Ethernet wiring connectors shall be RJ-45 male modular plug connectors.
5. Industrial RJ45 Connectors:
 - a. Industrial connectors shall be an eight-position industrial connector for use in manufacturing environments. Connectors shall meet the TIA/EIA-568-B.2 standard for Cat-6 requirements. The connector shall incorporate an IP67 rated seal and shall provide protection from dust and temporary immersion in water. A tethered protective cap shall be provided. The connector shall accept a non-shielded Cat-6 solid twisted pair cable. Connectors shall be Panduit Industrial TX, or equal.

2.2 LOW-VOLTAGE WIRE AND CABLE ACCESSORIES

- A. Cable connectors shall be provided for terminating low-voltage wire and cable. Connectors shall be solderless type and properly sized to fit fastening device and wire size. Connectors shall be in accordance with the following:
 1. For wire sizes up to and including No. 6 AWG, compression type with UL 486A listing shall be used. All cable terminations for conductors No. 10 AWG and smaller shall be terminated using UL listed ring tongue type, nylon insulated connectors, at each terminal board.
 2. For wire sizes No. 4 AWG and above, either compression type or bolted type with tin-plated contact faces shall be used.
 3. For wire sizes No. 250 kcmil and larger, connectors with at least 2 cable clamping elements or compression indents and provision for at least 2 bolts for joining to apparatus terminal shall be used.
 4. Compression connectors shall be Power-Connect, ring tongue shall be Series 83 as manufactured by:
 - a. Ideal Industries, Sycamore, IL.
 - b. Thomas and Betts, Memphis, TN.
 - c. Burndy, Manchester, NH.
 - d. Or approved equal.
- B. Splicing for low-voltage wire and cable shall be performed when terminals are not provided. Splicing shall be in accordance with the following:
 1. For wire sizes No. 8 AWG and larger, splices shall be made up with compression type copper splice fittings with UL 486A listing. Splices shall be taped and covered with materials recommended by the cable manufacturers, to provide insulation equal to that on the conductors.
 2. For wire sizes No. 10 AWG and smaller, splices shall be made up with pre-insulated spring connectors. Connectors shall be flame retardant with UL listing.
 3. For wet locations, splices shall be waterproofed. Compression type splices shall be waterproofed by a sealant-filled, thick wall, heat shrinkable, thermosetting tubing or by pouring a thermosetting resin into a mold that surrounds the joined conductor. Waterproof compression splices shall be UL listed, heavy wall type. Spring connector splices shall be UL listed and waterproofed with a sealant-filler.
 4. Compression splices shall be manufactured by:

- a. Ideal Industries, Sycamore, IL.
 - b. Thomas and Betts, Memphis, TN.
 - c. Burndy, Manchester, NH.
 - d. Or approved equal.
5. Waterproof compression splices shall be thermo-shrink as manufactured by
- a. Ideal Industries, Sycamore, IL.
 - b. Thomas and Betts, Memphis, TN.
 - c. Burndy, Manchester, NH.
 - d. Or approved equal.
6. Spring connector splices shall be Twister type and Twister DB type for waterproof, as manufactured by:
- a. Ideal Industries, Sycamore, IL.
 - b. Thomas and Betts, Memphis, TN.
 - c. Burndy, Manchester, NH.
 - d. Or approved equal.
- C. Cable markers shall be provided for the identification of low-voltage wire and cable. Markers shall be in accordance with the following:
1. Markers shall be vinyl type, moisture, heat and abrasion resistant with adhesive back. Cable identification shall be clearly marked.
 2. Markers shall be as manufactured by:
 - a. Ideal Industries, Sycamore, IL.
 - b. Thomas and Betts, Memphis, TN.
 - c. Brady, Milwaukee, WI.
 - d. Or approved equal.
- D. Low-voltage wire and cable pulling lubricant shall be used to reduce wire and cable tension and sidewall pressure and aid in minimizing damage during low-voltage wire and cable installation. Pulling lubricant shall be in accordance with the following:
1. UL Listed, compatible with the wire insulation or cable jacket, the raceway involved and acceptable to the wire and cable manufacturer. When wire and cable manufacturer shall be provided.
 2. Pulling lubricant shall be water based, with a 0.17 average coefficient of friction and a temperature range of 20 to 120 degrees F.
 3. Pulling lubricant shall conform to IEEE 1210
 4. Pulling lubricant shall not support combustion.
 5. Pulling lubricant shall not cause residue to cement insulation or jackets to the inside of conduit or ducts.
 6. Pulling lubricant shall be as manufactured by:
 - a. American Polywater Corporation, Stillwater MN
 - b. 3M – St. Paul, MN
 - c. Ideal Industries, Sycamore, IL.
 - d. Or approved equal.

2.3 SHOP TESTS

- A. Certified Shop Tests:

CONTRACT No. 22-523
DIVISION 26 - ELECTRICAL

1. Shop testing shall be performed on the low-voltage wire and cable at the manufacturer's plant prior to shipment. Shop test shall be in accordance with the latest revisions of ICEA and UL and shall demonstrate that the wire and cable tested conforms to the requirements specified.
 2. The Contractor shall provide a shop test report. The report shall identify the tests performed and the results obtained.
 3. All low-voltage wire and cable shall be shop tested in accordance with the requirements of the Contract Specifications.
- B. Witnessed Shop Tests:
1. The Contractor shall perform witnessed shop tests in accordance with the Contract Specifications.
 2. The Engineer shall have access during working hours for inspection purposes to all parts of the works where material and cable are being manufactured, and all reasonable inspection and testing facilities shall be provided to him without increase in price. The Engineer may request that dielectric strength tests and measurements be made to verify the cable data furnished by the Contractor. For this purpose the Contractor shall furnish without increase in price, a length of cable, not to exceed 3 feet for each size to be cut from one or more reels as directed by the Engineer. Each sample shall be marked with a tag bearing full description of cable insulation and number of reel from which it is cut.

PART 3 - EXECUTION

3.1 GENERAL

- A. All low-voltage wires and cables shall be installed within the raceways as shown on the Contract Drawings. They shall be carefully handled so as to avoid twists or kinks in the conductors or damage to the insulation.
- B. The Contractor shall ensure that the manufacturer's recommended cable bending radii and pulling are not exceeded and that the number of conductors permitted in a conduit are in accordance with the latest applicable section of the NEC Code.
- C. No splices shall be permitted between terminals except at approved junction or terminal boxes. Boxes shall be provided as shown on the Contract Drawings or as required by Code for the pull lengths. No more than two terminations shall be made at each terminal point. Cable and wire runs shall be looped through pull boxes without cutting and splicing where possible. All splices below grade, in manholes, hand holes and wet locations shall be waterproofed.
- D. No splicing of instrument wiring shall be permitted. Instrument wiring shall be extended by use of field termination boxes employing labeled terminal strips. Shield continuity shall be maintained. Ultimate shield termination (ground) shall be at one end only.
- E. The mineral-insulated metal sheath cable manufacturer's representative shall review the cable installation to certify that the cables are installed in accordance with the manufacturer's requirements.

3.2 INSTALLATION OF WIRES AND CABLES

- A. Cables shall be installed complete with proper terminations at both ends. For each motor circuit, Contractor shall ensure proper phasing, phase sequence and motor rotation.
- B. Wire and cable contained within a single conduit shall be pulled simultaneously using insulating pulling compounds containing no mineral oil.
- C. Pulling tension on wires and cables shall be continuously monitored using a calibrated Dynamometer type device, having a calibration label within six months of its use.
- D. Cables shall be installed with maximum slack at all terminal points, boxes, handholes and manholes.
- E. Low-voltage cables located within manholes, handholes and boxes shall be wrapped with fireproofing tape for their entire length on an individual cable basis. Tape shall be 30 mills thick of self-extinguishing material which will not support combustion. Tape shall not deteriorate when subjected to water, salt, sewage or fungus and shall be secured with glass cloth tape. Low-voltage cables shall be fireproofed in accordance with the cable manufacturer's recommendations and then covered with tape extending at least one inch into any duct.

3.3 CONDUCTOR IDENTIFICATION

- A. Each conductor shall be labeled at each termination point and all splice locations. Carry individual conductor or circuit identification throughout, with circuit numbers or other identification stamped on terminal boards when provided or the cable so it is visible around the cable's circumference.
- B. Each conductor shall be identified in junction boxes, cabinets, and terminal boxes. Where no termination is made, use a plastic-coated, self-adhesive, wire marker. Where termination is made, use a plastic, pre-printed sleeve wire marker. Paper, self-adhesive wire markers shall not be used.
- C. In manholes and handholes, each power conductor shall be identified by a laminated plastic tag located so that it can be seen from center of manhole without moving adjoining wires. Bundle and mark control wires as listed in conduit and cable schedule.
- D. Multi-conductor control cables shall be color coded in accordance with ICEA S-58-679, Method 1, Table E
- E. The following identification scheme shall be used for all low-voltage power circuits:

Voltage	Colors				
	Neutral Conductor	Phase A Conductor	Phase B Conductor	Phase C Conductor	Ground Conductor
208/120V	White	Black	Red	Light Blue	Green
240/120V	White-Gray Stripe	Black-Blue Stripe	Red-blue Stripe	None	Green
480/277V	Gray	Brown	Orange	Yellow	Green

3.4 LOW-VOLTAGE WIRE AND CABLE FIELD TESTING

- A. After installation, all low-voltage wire and cable shall be field tested. The field tests shall be performed by the Contractor who shall furnish all testing equipment. The field tests shall be witnessed by the Engineer and certified by the Contractor. The Contractor shall provide a report identifying the tests performed and the results obtained.
- B. Each electrical circuit shall be tested after permanent wires and cables are in place to demonstrate that the circuit and equipment are connected properly and will perform satisfactorily, as required, as intended, and that they are free from improper grounds and short circuits. The tests shall consist of the following:
 - 1. Low-voltage wire and cable mechanical connections shall be individually tested after installation and before they are put in service with a calibrated torque wrench. Values shall be in accordance with manufacturer's recommendations.
 - 2. Low-voltage wires and cables shall be individually tested for continuity between the required termination points for each ungrounded and grounded conductor. Test wire and cable after installation and before first energization or before they are put in service with an approved continuity tester. Test results shall be as recommended by the wire and cable manufacturer or in accordance with NETA ATS, NEMA, ICEA Standards.
 - 3. Low-voltage wires and cables shall be individually tested for insulation resistance between ungrounded and grounded conductors, and from each ungrounded and grounded conductor to ground. Test wire and cable after installation and before first energization or before they are put in service with an approved insulation resistance tester, for one minute at a voltage rating recommended by the cable manufacturer or in accordance with NETA ATS, NEMA, and ICEA Standards.
 - 4. The insulation resistance for any given conductor shall not be less than the value recommended by the cable manufacturer or in accordance with NETA ATS, NEMA and ICEA Standards. Any cable not meeting the recommended value or which fails
 - 5. when tested under full load conditions shall be replaced with a new cable for the full length.
 - 6. Shielded instrumentation cable shields shall be tested with an ohmmeter for continuity along the full length of the cable and for shield continuity to ground.
 - 7. Connect Shielded instrumentation cables shall be connected to a calibrated 4-20 milliamp DC signal transmitter and receiver. Test at 4, 12, and 20 milliamp transmitter settings.

-END OF SECTION-

SECTION 26 05 21 – LABELING AND IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Labeling and identification shall be provided in accordance with the requirements specified under this section, Contract Specifications, and the Contract Drawings.
2. The labeling and identification shall be provided for the identification of equipment. The work shall include providing all voltage signs, equipment nameplates, conduit and cable markers, arc flash labels and tags for all equipment furnished under this Contract.

B. Related Sections:

1. Section 26 05 19 - Wires and Cables (600 Volt Maximum)
2. Section 26 05 33 - Electrical Raceway System

1.2 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include but not be limited to:

1. Prior to equipment submission, submit a list of proposed manufacturers with the products they produce proposed for the contract.
2. Submit signs, nameplates and other labeling and identification devices proposed for use with specifications and other data required to demonstrate compliance with the specified requirements.

1.3 REFERENCES

A. Labeling and identification shall comply with the latest applicable provisions and recommendations of the following:

1. NFPA 70 - National Electrical Code.
2. NFPA 70E - Standard for Electrical Safety in the Workplace
3. IEEE 1584 - IEEE Guide for Performing Arc-Flash Hazard Calculations
4. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels
5. NYC DEP BWT - Arc Flash Personal Protective Equipment BWT Guidelines.
6. OSHA 1910 Subpart S - Electrical

1.4 QUALITY ASSURANCE

- A. All labeling and identification signs and nameplates shall be provided in accordance with the, NFPA 70E and OSHA 1910 Subpart S.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. The labeling and identification devices shall be delivered, stored and handled in accordance with the manufacturer's recommendations.

PART 2 - PRODUCTS

2.1 HIGH VOLTAGE SIGNS

- A. High voltage signs shall be provided for equipment operating over 600 volts.
- B. High voltage signs shall be fiberglass reinforced polyester, rigid acrylic, or aluminum plate 1/16-inch thick. Finish shall be industry standard of red, white, and black graphics. Signs shall be 10 inches by 14 inches with the following exceptions:
 - 1. Use 7-inch by 10-inch signs where this is the largest size that can be applied.
 - 2. Use 14-inch by 20-inch signs where needed for adequate vision.
- C. High voltage signs shall read; "DANGER - HIGH VOLTAGE KEEP OUT".
- D. High voltage sign mounting screws shall be 3/16-inch diameter, round head, stainless steel, and self-tapping type.

2.2 EQUIPMENT NAMEPLATES

- 1. Equipment nameplates shall be provided in addition to the manufacturer's nameplate, to identify the equipment number and the item's function and the equipment to which it serves.
 - 2. Equipment nameplates shall be laminated plastic with black letters on a white background. Nameplates for equipment identification shall have 1/2-inch-high letter engravings. Nameplates for pilot device identification shall have 1/4-inch-high letter engravings.
 - 3. Nameplates for distribution equipment shall have the following information:
 - a. Equipment name and number.
 - b. Voltage.
 - c. Phases and number of wires.
- B. Pull boxes, junction boxes and control stations shall have a nameplate identifying the equipment name and number.
- C. All feeders and branch circuit devices shall have nameplates identifying the served equipment name and number. Where execution of the work under this Contract requires certain feeders and branch circuit devices to be modified, the Contractor shall provide new nameplates reflecting the modifications. The nameplates shall identify the served equipment name and number.

CONTRACT No. 22-523
DIVISION 26 - ELECTRICAL

- D. All control and indicating devices shall have individual nameplates identifying device function.
- E. Nameplate mounting screws shall be 3/16-inch diameter, roundhead, stainless steel and self-tapping type. Adhesives shall not be used.

2.3 CONDUIT MARKERS AND TAGS

- A. Conduit markers and tags shall be provided for the identification of the electric conduit system.
- B. Conduit markers and tags shall be in accordance with Section 26 05 33 – Electrical Raceway Systems.

2.4 CABLE AND WIRE MARKERS

- A. Cable and wire markers shall be provided for the identification of the electric wire and cable.
- B. Cable and wire markers shall be in accordance with Section 26 05 19 – Wires and Cables (600 Volt Maximum).

PART 3 - EXECUTION

3.1 INSTALLATION

- 1. All signs, nameplates and tags shall be installed neatly, properly and as recommended by the manufacturers.
- 2. Signs and nameplates shall be mounted with screws. Where mounting of signs or nameplates with screws is impractical, the Contractor shall alert the Engineer.
- 3. High voltage signs shall be installed on equipment operating at over 600 volts. High voltage signs shall also be installed on sides of fences or walls which enclose outdoor equipment operating at over 600 volts.
- 4. Control, signal and status wire and cable shall be identified by a unique number. The numbering system shall reflect the actual identification used in the work and shall be documented on the point-to-point wiring diagrams.

-END OF SECTION-

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SECTION 26 05 26 – GROUNDING SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Complete grounding system in strict accordance with Article 250 of the National Electrical Code (NEC), as shown on the Drawings and as specified herein.
2. The grounding work shall be a complete system for the electrical and instrumentation systems, structures, and equipment. The work shall include grounding of all electrical equipment, transformer neutrals, equipment enclosures, grounding electrodes, fences, and gates.
3. All raceways, conduits, ducts, and multi-conductor cables shall contain equipment grounding conductors sized in accordance with the NEC. Minimum sizes shall be No. 12 AWG.
4. A supplemental grounding conductor shall be provided from each switchgear, switchboard, motor control center to the buried ground grid. Supplemental grounding conductors shall be installed in PVC Schedule 80 conduit. The supplemental grounding conductors for switchgear and switchboard shall consist of redundant code sized cables in conduit. Conductors shall be connected to opposite ends of the distribution equipment ground bus.

B. Related Sections:

1. Section 26 05 33 – Electrical Raceway Systems
2. Section 26 05 10 – Wires and Cables (600 Volts Maximum)
3. Section 33 71 19 – Electrical Underground Ducts and Manholes

1.2 DEFINITIONS

A. Grounding

1. Grounding and grounding system shall be used interchangeable in this Section and the Specifications to mean, the means and methods by which all electrical and instrumentation systems are grounded for the purposes of attaining safety grounding, equalization of ground potential, reducing ground potential rises during fault events and the grounding of the ungrounded conductor as required by the NEC and Electric Utility Standards.

B. Electric Utility

1. All references to the Electric Utility shall mean the Consolidated Edison Company.

1.3 SUBMITTALS

- A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

CONTRACT No. 22-523
DIVISION 26 - ELECTRICAL

1. A list of proposed manufacturers with the products they produce proposed for the contract.
 2. Manufacturer's catalog cuts for the grounding materials proposed for use.
 3. Scaled Shop Drawings showing proposed routing and layout of the grounding system.
- B. Submit, shop drawings and product data, for the following:
1. Manufacturer's name and catalog data for ground rods, exothermic welding methods, grounding clamps including installation requirements and materials.
- C. Submit results of grounding and bonding resistance testing as specified herein.

1.4 REFERENCES

1. Grounding shall comply with the latest applicable provisions and recommendations of the following:
 - a. NFPA 70 - National Electrical Code.
 - b. Electric Utility - Standards and Guidelines.
 - c. UL Standard No. 467 - Electrical Grounding and Bonding Equipment.

1.5 QUALITY ASSURANCE

- A. The grounding system maximum resistance shall not exceed 5 ohms to earth under normally dry conditions. All structures and metal equipment containing electrical apparatus shall be connected to ground.
- B. All grounding associated with the Electric Utility's service feeders shall be in accordance with the requirements of Electric Utility Company.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. The grounding equipment shall be delivered, stored, and handled in accordance with the specifications and the manufacturer's recommendations.

PART 2 - PRODUCTS

2.1 GROUND CABLE

- A. The ground cable shall be soft drawn bare stranded copper conforming to ASTM B8 and B189, No. 8 AWG minimum size.
- B. The insulated cable for equipment grounding shall conform to the requirements of Specification 26 05 19 - Wires and Cables (600 Volt Maximum).
- C. Ground cable shall be as manufactured by:
 1. Erico
 2. General Cable, KY.
 3. Or approved equal.

2.2 GROUND RODS

- A. Ground rods shall be stainless steel, 3/4-inch diameter and 10 feet long.
- B. Ground rods shall have a drive point at the lower ends. The upper end of each rod shall be equipped with bronze, clamp type connectors with not less than four bolts.
- C. Ground rods shall be as manufactured by:
 - 1. Erico of Pentair
 - 2. Blackburn of Thomas and Betts, MN.
 - 3. Thompson Lightning Protection Inc, MN
 - 4. Or approved equal.

2.3 GROUNDING CONNECTORS

- A. Compression connectors shall be heavy duty copper. Bolted connectors shall be copper alloy castings, designed specifically for the items to be connected, and assembled with Durium or silicone bronze bolts, nuts, and washers.
- B. Buried grounding connections shall be by Cadweld process or approved equal exothermic welding system.
 - 1. Molds, cartridge materials and accessories shall be provided in kit form and selected per the manufacturer's written instructions for specific types, sizes and combinations of conductors and connected items. Molds and powder shall be furnished by the same manufacturer.
- C. Bolted or compression grounding connectors shall be as manufactured by:
 - 1. Burndy, Manchester, NH.
 - 2. Thomas and Betts, Memphis, TN.
 - 3. Or approved equal.
- D. Welded grounding connections shall be as manufactured by:
 - 1. Cadwell, WA.
 - 2. Or approved equal.
- E. Water pipe ground clamps shall be cast bronze saddle type, and of the correct size for the pipe, as manufactured by Thomas & Betts Co. Cat. No. 2 (1/2 in, 3/4 in, or 1 in size), similar by Burndy; O.Z. Gedney Co. or approved equal and of the correct size for the pipe.

2.4 GROUND ROD TEST WELLS

- A. Ground rod test wells shall be complete with cast iron riser ring and traffic cover marked "GROUND ROD". Boxes and covers shall be suitable for H-20 wheel loading.
- B. Test wells shall be as manufactured by Erico, T416A; Christy Co., No. G5; Lightning and Grounding System, Inc., Series I-R.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. A complete ground grid system shall be installed as shown on the Contract Drawings.
- B. Ground cable shall be installed around perimeter of structures at a minimum of 2 feet-6-inches below grade.
- C. Ground rods shall be installed 2 feet below grade, 2 feet from foundation walls and shall extend 10 feet vertically into the earth.
- D. Test points shall be installed at locations and in accordance with the details shown on the Contract Drawings.
- E. Equipment shall be connected in accordance with the details shown on the Contract Drawings. All steel column and underground connections shall be welded except for test points.
- F. Metal casings or supporting frames of electrical equipment, such as transformers, panel boards, control panels, motor control centers, and individual motor controllers shall be grounded. The equipment shall be thoroughly grounded to the facility grounding system. All metal conduits leaving all electrical equipment shall be grounded. Grounding type fittings shall be installed on flexible conduits.
- G. An insulated cable for equipment grounding shall be installed with the phase conductors within the conduit for the nominal 120 volt and higher power, lighting, and control circuits.

3.2 FIELD TESTING

- A. After installation, the completed ground system shall be field tested for operation and conformance. The field tests shall be witnessed by the Engineer and certified by the Contractor. The Contractor shall provide testing consisting of the following:
 - 1. Resistance testing shall be made using a Biddle, Null Balance Earth Tester or Fluke, Earth Ground Testers not less than 48 hours after rainfall. Resistance values above 5 ohms shall be brought to the Engineer's attention.
 - 2. Grounded cables and metal parts shall be continuity tested. The conduit system shall be ground tested in accordance with the requirements of Section 26 05 33 – Electrical Raceway Systems.
- B. The Contractor shall provide a Field Test Report, the report shall identify the testing performed and the results obtained.

-END OF SECTION-

SECTION 26 05 29 – HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Raceway Supports
- B. Related Sections:
 - 1. Section 26 05 01 - Electrical - General Provisions
 - 2. Section 26 05 26 - Grounding System
 - 3. Section 26 05 33 - Electrical Raceway Systems
- C. Furnish and install complete raceway supports as shown on the Drawings and as specified herein.
- D. Home runs indicated are to assist the contractor in identifying raceways to be installed concealed or exposed. Support raceways identified on the Drawings near the ceilings or along the walls of the areas through which they pass and shall be routed to avoid conflicts with HVAC ducts, cranes and hoists, lighting fixtures, doors, and hatches. Support as raceways indicated concealed in the center of concrete floor slabs, in partitions, or above hung ceilings, as required.
- E. Furnish all labor, materials, equipment, accessories, and components and install a complete seismic restraint and support system for raceway systems as indicated on the Drawings and as specified herein.
 - 1. All supports, hangers, bracing and appurtenances shall conform to the latest applicable requirements of the New York State Building Code except as supplemented or modified by the requirements specified in this Section.
- F. The Contractor shall engage the services of an independent professional engineer registered in the State, with specific experience in the design of seismic restraints and supports for electrical supporting systems hereinafter referred to as support engineer

1.2 SUBMITTALS

- A. Submit, the manufacturers' names and product designation or catalog numbers with marked cut sheets of all materials specified.
- B. Submittals shall include type of hanger and/or support, location, support reaction transmitted to the structure and type of anchor and other supporting appurtenance including structural fasteners.
- C. Contractor shall submit Shop Drawings and material specifications for approval of the Engineer. Submittals shall include, but not be limited to the following:
 - 1. Manufacturer's catalog cuts for the supporting devices proposed for use with specifications and other data required to demonstrate compliance with the specified requirements.

2. Scaled Shop drawings showing dimensions and locations of all items and clearance requirements.
3. Support design details and equipment seismic anchorage and restraint details, stamped by a licensed Engineer as required.

1.3 REFERENCES

- A. Supporting devices shall comply with the latest applicable provisions and recommendations of the following:
 1. ASTM A1011/A1011M - Standard Specification for Steel, Sheet, and Strip, Hot-Rolled, Carbon, Structural, High-Strength, Low-Alloy, High-Strength, Low-Alloy with Improved Formability, and Ultra-High Strength
 2. ASTM B633: Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
 3. NYSCC: New York State Construction Code.
 4. MFMA 103: Guidelines for the Use of Metal Framing.
 5. MFMA 4: Metal Framing Standards Publication.

1.4 QUALITY ASSURANCE

- A. General:
 1. All channels, fittings and hardware used in the supporting system shall be in accordance with MFMA 4 and MFA 103.
 2. The design of the support system shall be the responsibility of the Contractor. The Contractor shall provide the proper sized rods, channels, fittings, brackets, and appurtenances necessary to adequately support the equipment.
 3. The Contractor shall retain the services of a Licensed Engineer, registered in the State of New York, to prepare support details for equipment exceeding 50 pounds in weight. The Engineer shall stamp the support system design details.
- B. Seismic Requirements:
 1. Equipment assemblies such as secondary unit substations, switchgear, transformers, motor control centers and panelboards shall be certified to meet seismic requirements of the New York State Building Code.
 2. The Contractor shall provide equipment anchorage details for all equipment certified to meet seismic requirements. The details shall be coordinated with the manufacturer's equipment mounting provisions.
 3. Electric conduit shall include seismic restraints in accordance with the requirements of Specification 26 05 33 - Electrical Raceway Systems.
 4. The Contractor shall retain the services of a Licensed Engineer, registered in the State of New York, to prepare the seismic anchorage and restraint details. The Engineer shall stamp the seismic anchorage and restraint details.

PART 2 - PRODUCTS

2.1 HARDWARE

A. Conduit Mounting Equipment

1. Hangers, rods, backplates, beam clamps, channel, etc shall be galvanized iron or steel.
2. Furnish any and all necessary supports, brackets, conduit sleeves, racks and bracing as required. All boxes and hardware shall be galvanized zinc plated steel.

B. Wall and Floor Slab Opening Seals

1. Wall and floor slab openings shall be sealed with a UL approved expanding material which equals or exceeds the fire rating of the wall or floor construction as manufactured by the Thomas & Betts Corp.; Pro Set Systems; NEER Mfg. Co.; Specified Technologies, Inc. or approved equal.

C. Conduit Supports

1. Trapezes
 - a. Beams, channels, struts, hangers, bracing, rods, beam clamps, accessories and components shall be galvanized steel.
2. Flush Mounted Supports
 - a. Channels, struts, accessories, and components shall be galvanized steel.
3. Conduit Racks
 - a. Conduit racks, accessories and components shall be galvanized steel.
4. Conduit Hangers
 - a. Conduit clamps, rods, beam clamps, bracing, accessories, and components shall be galvanized steel.
5. Adjustable steel and plastic band hangers, adjustable band hangers, adjustable swivel ring hangers and J-hangers shall not be allowed.
6. All hangers, bracing, rods, beam clamps, accessories and components shall be as manufactured by the Carpenter & Paterson Inc.; Grinnell Corporation; B-Line Systems Inc. or approved equal.
7. Design of supplemental structural steel required for attachment to the building structural support system shall be the full responsibility of the Support Engineer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Conduit supports, other than for underground raceways, shall be spaced at intervals not exceeding the distance required by the NEC to obtain rigid construction.
- B. Single conduits shall be supported by means of one hole pipe clamps in combination with one screw back plates, to raise conduits from the surface. Multiple runs of conduits shall be supported on fabricated channel trapeze type racks with steel horizontal members and threaded hanger rods. The rods shall be not less than 3/8 in diameter. Surface mounted panel boxes, junction boxes, conduit, etc, shall be supported by spacers to provide a minimum of 1/2 in clearance between wall and equipment.

- C. Conduit Supports (Other than Underground Raceways)
1. Trapezes
 - a. Conduit support trapezes shall be vertically supported every 10-ft or less, as required to obtain rigid conduit construction.
 - b. Lateral seismic restraints (Sway Bracing) shall be spaced 30-ft or less.
 - c. Horizontal seismic restraints shall be spaced at 40-ft or less. There shall be at least one horizontal restraint per horizontal run.
 - d. Attachment to structural steel shall be by beam clamps or welded beam attachment. C-clamps will not be allowed for vertical hangers. Side beam clamps with beam hooks shall be used for seismic restraint only.
 - e. Attachment to concrete shall be cast-in-place inserts, cast-in place welded plates with welded studs or stainless-steel adhesive anchors.
 2. Flush Mounted Supports
 - a. Support shall be spaced 10-ft or less, as required to obtain rigid conduit construction.
 - b. Attachment to concrete shall be with cast-in-place inserts, cast-in place welded plates with welded studs or stainless adhesive anchors.
 3. Conduit Racks
 - a. Support shall be spaced 10-ft or less, as required to obtain rigid conduit construction.
 - b. Horizontal seismic restraints shall be spaced at 30-ft or less.
 - c. Attachment to concrete shall be with cast-in-place inserts, cast-in place welded plate with welded studs or stainless adhesive anchors.
 4. Conduit Hangers
 - a. Conduit hangers shall be vertical supported 10-ft or less, as required to obtain rigid conduit construction.
 - b. Lateral seismic restraints (Sway Bracing) shall be spaced 20-ft or less.
 - c. Horizontal seismic restraints shall be spaced at 30-ft or less. There shall be at least one horizontal restraint per horizontal run.
 - d. Attachment to structural steel shall be by beam clamps or welded beam attachment. C-clamps will not be allowed for vertical hangers. Side beam clamps with beam hooks shall be used for seismic restraint only.
 - e. Attachment to concrete shall be cast-in-place inserts, cast-in place welded plates with welded studs or stainless-steel adhesive anchors.
 5. All reinforcing bars shall be located by the Contractor with the use of a rebar locator prior to installing adhesive capsule type anchors. Mark the location of all reinforcing bars in an area bounded by a line drawn at least 18-in from the edge of the support bearing/weld plates on all four sides of the bearing/weld plates prior to fabricating and installing bearing/weld plates.
 6. Where interference occurs, adjust anchor locations to clear reinforcing bars and alter support configuration at no additional cost to the Authority.
- D. Miscellaneous steel for the support of fixtures, boxes, transformers, starters, contactors, panels and conduit shall be furnished and installed. Channel supports shall be ground smooth and fitted with plastic end caps.
- E. Steel channels, flat iron and channel iron shall be furnished and installed for the support of all electrical equipment and devices, where required, including all anchors, inserts, bolts, nuts, washers, etc, for a rigid installation. Channel supports shall be ground smooth and fitted with plastic end caps.

CONTRACT No. 22-523
DIVISION 26 - ELECTRICAL

- F. Provide sway braces for cable trays and busducts. Sway braces shall be U-channel supports installed at a 45-degree angle from the tray or busduct and anchored to the concrete ceiling structure or structural support system. Braces shall be provided on 20-ft spacing centers. Alternate the direction of the bracing supports.
- G. Conduits terminating at a cable tray or busduct shall be supported independently from the busduct or cable tray. Provide a conduit support within 1-ft of the cable tray or busduct. The weight of the conduit shall not bear on the cable tray or busduct.
- H. All conduits on exposed work, within partitions and above suspended ceilings, shall be run at right angles to and parallel with the surrounding wall and shall conform to the form of the ceiling. No diagonal runs will be allowed. Bends in parallel conduit runs shall be concentric. All conduits shall be run perfectly straight and true.
- I. Conduits shall not cross pipe shafts, access hatches or vent duct openings. They shall be routed to avoid such present or future openings in floor or ceiling construction.
- J. Conduits shall be located a minimum of 3 in from steam or hot water piping. Where crossings are unavoidable, the conduit shall be kept at least 1 in from the covering of the pipe crossed.

-END OF SECTION-

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SECTION 26 05 33 – ELECTRICAL RACEWAY SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Requirements for providing conduit system. The conduit system shall be provided in accordance with the requirements specified under this section, the Contract Specifications, and the Contract Drawings.
2. The conduit system required shall be provided with all rigid and flexible conduits, boxes, fittings, supports, hangers and inserts and other conduit accessories as required for the installation of the electric wire and cable.

B. Related Sections:

1. Section 05 50 00 - Metal Fabrications and Anchorage
2. Section 09 90 00 - Painting.
3. Section 26 05 29 - Hangers and Supports
4. Section 26 05 26 - Grounding System

1.2 DEFINITIONS

- A. Conduit System: Shall mean a complete installation comprising all rigid conduit and flexible connections, boxes, fittings, supports, hangers, inserts and other conduit accessories as required for the installation of electric wires and cables.
- B. Conduit Accessories: Shall mean all fittings required to ensure a complete conduit system installation. Conduit accessories shall include, but is not limited to, expansion, deflection, seal and drain fittings, hubs, bushings, duct seal, tags, markers, thru-wall seals and bushings.

1.3 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. A list of proposed manufacturers with the products they produce proposed for the contract.
2. Manufacturer's catalog cuts for the conduit, boxes, fittings and supports proposed for use.
3. Construction details of conduit racks and other conduit support systems with seismic restraint details and calculations signed by a licensed Engineer.
4. Scaled Shop Drawings showing proposed routing of all conduits, inclusive of conduits embedded in structural concrete and conduits directly buried in earth.
5. Scaled Shop Drawings showing locations of pull and junction boxes and all penetrations in walls and floor slabs.

1.4 REFERENCES

1. Electric conduit system shall comply with the latest applicable provisions and recommendations of the following:
 - a. NEC – National Electrical Code.
 - b. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
 - c. UL 6 - Rigid Metal Electrical Conduit -Steel.
 - d. UL 50 - Standard for Enclosures for Electrical Equipment.
 - e. UL 360 - Standard for Liquid-Tight Flexible Metal Conduit.
 - f. UL 514A - Metallic Outlet Boxes.
 - g. UL 514B - Conduit, Tubing and Cable Fittings.
 - h. ANSI C80.1 - Electric Rigid Steel Conduit.

1.5 QUALITY ASSURANCE

- A. Comply with applicable provision of standards and codes below and others having jurisdiction.
 1. Underwriter Laboratories, Incorporated.
 2. National Fire Protection Association.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Electric conduit system shall be delivered, stored, and handled in accordance with the Contract Specifications, the manufacturer's instructions, and the following:
 1. Conduit shall be delivered to the work in standard bundles having each length suitably marked with the manufacturer's name or trademark and bearing the label of the Underwriters' Laboratories, Incorporated inspection service.

PART 2 - PRODUCTS

2.1 RIGID STEEL CONDUIT

- A. The Contractor shall provide rigid steel conduit. All steel conduits shall comply with the requirements of ANSI C80.1, and UL 6.
- B. Both the inside and outside surfaces of the rigid steel conduit shall be protected against corrosion by a coating of zinc applied by the hot-dip galvanizing process.
- C. Conduits, elbows and couplings shall be rigid, heavy wall, mild steel, hot dip galvanized. Conduits, elbows and couplings shall have a smooth interior with tapered threads and carefully reamed ends. Conduit size shall be 3/4-inch minimum and shall conform to UL 6.
- D. Rigid steel conduit shall be as manufactured by:
 1. Allied Tube and Conduit Corporation, Philadelphia, PA.
 2. Wheatland Tube Company, Sharon, PA.
 3. Republic Conduit, Louisville, KY.
 4. Or approved equal.

2.2 ELECTRICAL METALLIC TUBING CONDUIT (EMT)

- A. Electrical Metallic Tubing (EMT), couplings, factory elbows and fittings shall be hot-dipped galvanized steel with organic corrosion resistant inner diameter coating and shall comply with ANSI C 80.1, ANSI C 80.3, and UL797.
- B. EMT conduit fittings shall be of the threaded compression type and shall be steel with a hot-dipped galvanized finish. Threadless fittings and split couplings are not permitted except in specific applications when approved by the Engineer.
- C. Acceptable manufacturers:
 - 1. Allied Tube and Conduit Corporation, Philadelphia, PA.
 - 2. Wheatland Tube Company, Sharon, PA.
 - 3. Republic Conduit, Louisville, KY.
 - 4. Or approved equal.

2.3 HANGERS, SUPPORTS AND INSERTS

- A. The Contractor shall provide hangers, supports, and inserts for support of the electric conduit system. The supports shall securely attach the electric conduit system to the channel and structure.
- B. The electric conduit system shall be designed, constructed, and installed suitable for earthquake regulations in accordance with the seismic requirements of the New York State Building Code and the Uniform Building Code for Zone 2A application.
- C. Transverse and longitudinal bracing shall be provided as required to brace the electric conduit for the seismic requirements specified.
- D. All drilled in type concrete inserts shall be expansion shields or anchors conforming to Sections 05 50 00 Metal Fabrications and Anchorage and 26 05 29 - Hangers and Supports.
- E. Hangers and supports shall be in accordance with the requirements of Section 26 05 29 - Hangers and Supports except beam clamps, hanger rods and hardware shall be steel with electro-plated zinc finish. This shall also include bolts, nuts and washers. Hangers, Supports and Inserts shall be as manufactured by:
 - 1. B-Line by Eaton, Highland, IL.
 - 2. Kindorf, Harahan, LA.
 - 3. Or approved equal.

2.4 NON-METALLIC CONDUIT AND FITTINGS

- D. PVC conduit shall be rigid polyvinyl chloride Schedule 80 Rigid PVC conduit up to trade sizes 3-1/2-in shall comply with NEMA TC-2 and UL/651 and shall be sunlight resistant, rated for use with 90 degree C conductors in exposed, direct burial or concrete encased applications. Underground utility duct, 4-in trade size and above, shall be polyvinyl chloride (PVC) Schedule 40 high density polyethylene (HDPE) conduit encased in concrete, rated for use with 90 degree C conductors and shall comply with UL/651A, NEMA TC-8 and ASTM F512.

CONTRACT No. 22-523
DIVISION 26 - ELECTRICAL

- E. Connectors, couplings, fittings, and ancillary materials shall be supplied by the conduit manufacturer. Connectors, fittings, and ancillary materials shall be rated for the environment for which they are installed.
- F. Acceptable manufacturers:
 - 1. Carlon Corp.
 - 2. Cantex, Inc.
 - 3. Allied Tube and Conduit
 - 4. Or approved equal.

2.5 FLEXIBLE METALLIC CONDUIT

- A. The Contractor shall provide flexible metallic conduit where required to permit movement of connected devices and where it is impracticable to complete runs with rigid conduit.
- B. Flexible conduit used indoor areas shall be non-liquid-tight, with a steel core.
- C. Flexible conduit used outdoors shall be UL Listed and include a hot dipped galvanized steel core with a liquid-tight, polyvinyl chloride cover and shall include a built-in copper ground for sizes 3/4-inch through 1-1/4 inch.
- D. Flexible conduit shall be as manufactured by:
 - 1. Anaconda American Brass Company, Rolling Meadows, IL.
 - 2. Electric-Flex Company, Roselle, IL.
 - 3. Or approved equal.

2.6 OUTLET BOXES AND FITTINGS

- A. The Contractor shall provide outlet boxes and fittings for rigid and flexible conduit. The outlet boxes and fittings required for the work which constitutes a part of the conduit system, shall be of approved types.
- B. For outdoor areas, conduit fittings and outlet bodies shall be cast gray iron alloy, cast malleable iron bodies, and covers. All units shall be gasketed, watertight, and threaded with five full threads and shall have rustproofing in accordance with the requirements of this section.
- C. Threaded cast ferrous metal, hub type outlet boxes shall be used throughout, except in the interior walls of superstructures and in roof slabs protected by built-up roofing where pressed steel boxes shall be installed. Cast iron or alloy outlet boxes of the proper size and depths for the application, complete with watertight gaskets and covers secured by brass screws, shall be furnished, and installed as indicated on the Contract Drawings or as required by the conduit run. Outlet boxes, furnished and installed for the installation of lighting fixtures, switches and receptacles in a future contract, shall be furnished with watertight gaskets and blank covers.
- D. For indoor areas, pressed steel boxes of the proper size and depths for the application shall be provided. Boxes shall be rated NEMA 12, not less than No. 14 U.S. Standard Gauge (0.078 inch). The conduit openings shall be provided with oil-resistant gaskets. Conduits shall be fastened to these boxes with locknuts and bushings, and all unused outlets or holes shall be left sealed.

CONTRACT No. 22-523
DIVISION 26 - ELECTRICAL

- E. All outlet boxes intended for the support of fixtures shall be provided with approved fixture studs.
- F. For concealed conduit runs in outside walls and all exposed conduit work, connections to boxes and fittings shall be made through threaded holes, unless otherwise approved by the Engineer. For concealed conduit work in areas other than outside walls, connections between conduit and boxes may be made with drilled holes, using locknuts and bushings.
- G. Where necessary unions may be used. Unions shall be universal or Erickson type by:
 - 1. Thomas & Betts, Memphis, TN.
 - 2. Or approved equal.
- H. All boxes installed for concealed conduit, shall be provided with extension rings or plaster rings, and covers as required. For indoor areas stainless 302/304, satin beveled steel cover and device plates for surface mounted boxes shall be used. For outdoor areas, galvanized ferrous and galvanized cast ferrous metal cover and device plates with neoprene gaskets shall be used.

2.7 CONDUIT ACCESSORIES

- A. The Contractor shall provide conduit accessories for use with the conduit system. The conduit accessories shall be of approved types.
- B. Expansion and Deflection Fittings:
 - 1. Expansion and deflection fittings shall be made up of non-corrodible parts and shall provide for ample longitudinal and lateral movement. A suitable bond shall provide a low resistance, continuous longitudinal path for ground currents.
 - 2. Expansion and deflection fittings shall be watertight cast iron, malleable iron or hot dipped galvanized. Fittings shall be corrosion-resistant, UL listed and compatible with the conduit system.
 - 3. Expansion /deflection fittings shall provide both expansion and deflection in a single fitting in accordance with the following:
 - a. Axial expansion or contraction up to 3/4-inch.
 - b. Angular misalignment up to 30 degrees.
 - c. Parallel misalignment up to 3/4-inch.
 - 4. Expansion fittings shall provide expansion /contraction with eight-inch total movement.
 - 5. Expansion and deflection fittings shall be as manufactured by:
 - a. Crouse-Hinds, Syracuse, NY.
 - b. Appleton Electric, Rosemont, IL.
 - c. Or approved equal.
- C. Drain Fittings:
 - 1. Drain fittings shall be a combination device designed to provide ventilation to minimize condensation and drains accumulated condensate.
 - 2. The combination drain/breather fitting shall be 3/8-inch male thread size with stainless steel body.
 - 3. Drain fittings shall be as manufactured by:
 - a. Crouse-Hinds, Syracuse, NY.
 - b. Appleton Electric, Rosemont, IL.
 - c. Or approved equal.

D. Conduit Hubs:

1. Conduit hubs shall be threaded, insulated throat type with bonding screw locknut.
2. The conduit hub and locknut shall be malleable iron or zinc and shall include a 90 degree C insulating surface and a sealing ring for a watertight and dust tight connection.
3. Conduit hubs shall be as manufactured by:
 - a. O-Z/Gedney Rosemont, IL.
 - b. Thomas and Betts, Memphis, TN.
 - c. Or approved equal.

E. Conduit Bushings:

1. Conduit bushings shall be insulated, grounding type with lay-in-lug connection. Two locknuts shall be provided for each bushing.
2. The conduit bushing and locknuts shall be steel, malleable iron or zinc. The bushing shall include a 90 degrees C insulating surface.
3. Conduit bushings and locknuts shall be as manufactured by:
 - a. O-Z/Gedney, Rosemont, IL.
 - b. Thomas and Betts, Memphis, TN.
 - c. Or approved equal.

F. Duct Seal:

1. Duct seal shall be a suitable for forming a water and gas tight seal between cables and conduits.
2. Completed seal shall be resistant to gasoline, oils, dilute acids and bases.
3. The completed seal shall be capable of blocking water pressure of at least 10 psi.
4. Duct seal shall be by
 - a. American Polywater Corp, Stillwater, MN
 - b. O-Z/Gedney, Rosemont, IL.
 - c. Ideal Industries, Sycamore, IL.
 - d. Or approved equal. .

G. Thruwall Seals and Bushings:

1. Thruwall seals and bushings shall be in accordance with the following:
 - a. For conduits and cables in new construction and passing through exterior subsurface walls and exterior concrete walls, thruwall seals shall be used. Thruwall seals shall be Type WSK and WSCS as manufactured by:
 - 1) O-Z/Gedney Rosemont, IL.
 - 2) Or approved equal.
 - b. For conduits and cables in new construction and passing through concrete floors and floor slabs, floor seals shall be used. Floor seals shall be type SK and FSCS as manufactured by:
 - 1) O-Z/Gedney, Rosemont, IL.
 - 2) Or approved equal.
 - c. For conduits passing through exterior block walls or installed in existing construction passing through exterior subsurface walls, exterior concrete walls, floor slabs and roof slabs for use in core bit-drilled holes sealing bushings shall be used. Sealing bushings shall be Type CSMI at the inside of the structure and Type CSMC at the outside of the structure, within the same core drilled hole. Sealing bushings shall be as manufactured by:

- 1) O-Z/Gedney, Rosemont, IL.
 - 2) Or approved equal.
- d. For conduits passing through existing interior concrete walls or floors and interior block walls sealing bushings shall also be used. Sealing bushings shall be CSMC or CSMI type as manufactured by:
- 1) O-Z/Gedney, Rosemont, IL.
 - 2) Or approved equal.
- e. For conduits passing through fire rated floors and walls fire stop fittings shall be used. Fire stop fittings shall be CFS and/or CFSI type as manufactured by:
- 1) O-Z/Gedney, Rosemont, IL.
 - 2) Or approved equal.
- f. For multiple conduit runs passing through interior or exterior and fire rated walls thru- wall barriers shall be used. Thru-wall barriers shall be TW series as manufactured by:
- 1) Crouse-Hinds, Syracuse, NY.
 - 2) Or approved equal.

H. Conduit Tags:

1. Conduit tags shall be 19 gauge, 1-1/2-inch diameter round brass which shall be secured to the conduit with annealed brass wire.
2. Conduit tags shall be clearly stamped with the conduit number in conformity with the conduit and cable schedule or as directed by the Engineer.
3. Conduit tags shall be as manufactured by:
 - a. Seton Nameplate Corporation, Branford, CT.
 - b. Or approved equal.

I. Conduit Markers:

1. Conduit identification markers shall be self-sticking color-coded tape. Identification tape shall be two inches wide and colored in accordance with the color banding specified under this Section.
2. Conduit markers shall be as manufactured by:
 - a. Thomas and Betts, Memphis, TN.
 - b. Or approved equal.

2.8 TERMINAL, JUNCTION AND PULL BOXES

- A. The Contractor shall provide terminal, junction and pull boxes as shown on the Contract Drawings and where otherwise required, or as directed by the Engineer.
- B. Boxes located in indoor areas shall be NEMA Type 12, constructed of welded and galvanized sheet steel. Boxes of dimensions 24 inches and less shall be 14 USS standard gauge metal. Boxes of dimensions greater than 24 shall be 12 USS standard gauge metal, except 10 USS standard gauge shall be used for boxes with any dimension of 36 inches or more.
- C. Boxes located in wet locations boxes shall be watertight NEMA Type 4. Boxes shall be constructed of galvanized cast iron and shall include gasketed, bolt on covers, with tapped holes in bosses or hubs for conduit entrance. Boxes shall be provided with cast mounting lugs for installation in concrete.
- D. Pull and junction boxes shall be provided with covers held in place by brass screws. Terminal boxes shall be provided with terminal block supports and approved hinged covers

- fitted tightly against a gasket and secured by lug bolts and wing nuts. Hinges, lug bolts, wing nuts and other fittings shall be made of an approved, non-ferrous, non-corrodible metal. All boxes shall be provided with rabbeted gaskets or flange gaskets securely held in place.
- E. Tapping for threaded connections to outlet boxes, junction boxes, pull boxes and conduit fittings shall conform to the following:
1. All threads shall be tapered.
 2. If threads for connection of conduit are tapped all the way through a hole in an enclosure, or if an equivalent construction is employed, there shall be not less than 3-1/2 threads in the metal and the construction of the enclosure shall be such that a suitable conduit bushing can be properly attached.
 3. If threads for connections of conduit are not all the way through a hole in a box wall, conduit hub or the like, there shall be not less than five full threads in the metal and there shall be a smooth, well rounded inlet hole for the conductors, which shall afford protection to the conductors equivalent to that provided by a standard conduit bushing and which shall have an internal diameter approximately the same as that of the corresponding trade size of rigid conduit. The threaded hole shall be provided with a conduit end stop.
- F. Cast iron or cast ferrous alloy outlet boxes, junction boxes, pull boxes, conduit fittings and conduit accessories such as box covers shall be rust-proofed by zinc coating applied by the "hot-dip" process or shall be given a rust protective coating applied by either of the following methods:
1. Method A:
 - a. Castings shall be given a mechanical and chemical cleaning.
 - b. Castings shall be given a phosphoric acid type dip.
 - c. Then a coating of zinc chromate primer shall be applied, and finally
 - d. A coating of baked enamel finish shall be applied over the outside and inside surfaces of the castings.
 2. Method B:
 - a. Castings shall be given a mechanical and chemical cleaning.
 - b. Then a coating of cadmium shall be deposited electrolytically.
 - c. Then a coating of zinc shall be applied by electroplating.
 - d. Then a vinyl resin base aluminum lacquer shall be applied.
- G. Stamped steel outlet boxes, junction boxes and box covers shall be rust-proofed by a zinc coating applied by an electro-galvanizing or sherardizing process. Fabricated sheet steel boxes shall be formed from galvanized sheet steel. Welded joints shall be touched up with aluminum lacquer and boxes and covers shall be given a shop priming coat of zinc chromate rust inhibiting paint.
- H. Terminal blocks shall be used within terminal boxes for termination of prepared conductors No. 10 AWG and smaller. Terminal blocks shall be in accordance with the following:
1. Terminal blocks shall be high density, screw terminal type suitable for rail mounting with quantities sufficient for the conductors to be terminated plus 20 percent spare.
 2. Terminal blocks shall be NEMA rated, 600 volt, 35 ampere suitable for 85 degrees C.
 3. Terminal block components shall have stainless steel and tin plated copper alloy components, backed out captive screws and marking surface.
 4. Terminal blocks shall be as manufactured by:
 - a. Allen-Bradley Company, Milwaukee, WI.
 - b. General Electric Company, Fairfield, CT.

- c. Or approved equal.

PART 3 - EXECUTION

3.1 GENERAL

- A. Refer to Table 26 05 33-1 for specific raceway application requirements, unless otherwise indicated on the Drawings.
- B. All conduit of a given type shall be the product of one manufacturer.
1. Minimum conduit trade size for exposed or concealed runs shall be 3/4". Minimum conduit trade size for conduit embedded in concrete reinforced ductbank shall be 2"
 2. Refer to Section 33 71 19 for underground applications.

TABLE 26 05 33-1	
Raceway Application Guidelines	
<i>3. Location/Circuit Type</i>	<i>4. Raceway Type</i>
<u>Interior – concealed dry spaces</u>	<ul style="list-style-type: none"> ▪ Conceal raceways in walls above hung ceilings in rooms and areas that have finished interiors, Electrical Metallic Tubing (EMT)
<u>Interior Clean, dry finished areas</u>	<ul style="list-style-type: none"> ▪ Electrical Metallic Tubing (EMT)
<u>Wet Areas/ Outdoors Above Ground</u>	<ul style="list-style-type: none"> ▪ Galvanized Rigid Steel (GRS).
<u>Outdoor underground areas</u> - all locations.	<ul style="list-style-type: none"> ▪ Underground conduit for all wiring circuits –PVC schedule 80.

- C. All conduits shall be installed in accordance with the requirements specified under this section and in conformity with the sizes stated in the Contract Specifications or shown on the Contract Drawings. They shall be installed complete with all accessories, fittings, and boxes, in an approved and workmanlike manner so as to provide proper raceways for electrical conductors.
- D. The Contractor's attention is called to the fact that all conduit runs indicated on the Contract Drawings are shown diagrammatically for the purpose of outlining the general method of routing the conduits to avoid interference. Where conduit runs are not shown, it shall be the responsibility of the Contractor to establish the runs required based upon the various systems shown on the Contract Drawings.

CONTRACT No. 22-523
DIVISION 26 - ELECTRICAL

- E. Should any structural difficulties prevent the setting of cabinets, boxes, conduits, etc., at points shown on the plans, deviations therefrom as determined by the Engineer will be permitted and shall be made without additional cost.
- F. All exposed steel conduits, fittings, boxes, straps, racks, and hangers shall be painted in conformity with Section 09 90 00 - Painting. Conduits shall be tagged using conduit tags. Conduit tags shall be installed where conduits terminate in equipment and enclosures.
- G. Exposed conduits shall be color banded using conduit markers. Markers shall also include operating voltage when over 600 volts. Conduit markers shall be installed 360 degrees, double wrap around conduit exterior. Conduit markers shall be installed where conduits enter equipment, boxes, within each room, at wall penetrations and 50 feet on centers in each area. When exposed conduits are to be painted, markers shall be installed after the conduits are painted. Color banding shall be in accordance with the following:
 - 1. 208Y/120 volt AC: Gray.
 - 2. 277/480 volt or 480 volt AC: Sand.
 - 3. Fire Detection and Alarm: Red.
 - 4. Telephone: Blue.
 - 5. Intercommunication: Yellow.
 - 6. Security System: Rust.
 - 7. Low Voltage Switching, Instrumentation and Controls System: Black.
- H. All enclosing cases, including condulets and conduit bodies, for fire, sprinkler, smoke detection, and associated systems alarm apparatus and equipment shall be painted or colored Fire Department "RED", in accordance with New York State Building Code, unless otherwise required by the local Authority Having Jurisdiction (AHJ).

3.2 INSTALLATION OF RACEWAYS

- A. The Contractor shall install all exposed raceways parallel or at right angles to walls and ceiling beams. Changes in directions shall be made with bends, elbows and pull boxes. All parallel runs shall be spaced uniformly throughout and secured in place with hangers and fasteners. Brace raceways to satisfy the specified seismic requirements in accordance with the restraint details.
- B. Conduits, where exposed, shall in all cases be substantially supported in an approved manner, but they shall not be fastened to or come in contact with any other pipes, ducts, or other work of a similar nature. In all exposed work, approved channel or angle iron hangers, racks, one-hole straps or a combination thereof shall be provided to support the conduits. Where conduits are supported with one-hole straps, spacers shall be used to provide 1/4-inch minimum clearance between the conduits and walls or ceilings.
- C. Hanger rods for trapeze type hangers shall be not less than 5/8-inch diameter. Conduit supports shall be located at intervals not exceeding 8 feet. Conduits shall be securely fastened to each support with U-bolts, straps, or clamps.
- D. All concealed conduits shall be placed in walls, floors, ceilings, or slabs at the proper time in accordance with the progress of the structural work. The Contractor shall cooperate in every respect in meeting schedules and shall not delay the structural work unnecessarily.
- E. Conduits embedded in concrete shall be blocked and braced in place by use of adequate conduit separators to prevent displacement during the pouring of concrete. The Contractor

- will be held responsible for proper position of conduits and shall rearrange any conduit that may be displaced while concrete is poured, without additional cost.
- F. Where conduit runs are to be concealed and the Contractor fails to place such conduit in sufficient time to be included in the structures and the structures are completed without such conduit, the Contractor shall install such runs either concealed or exposed as directed by the Engineer, with no extra payment for additional work or for more conduit than the original lengths.
- G. Embedded conduit shall be run in structural concrete in the center of slabs and walls and above waterstops. Conduit connections shall be made watertight. Contractor shall confirm that concrete thickness is sufficient for embedding the quantity of conduits intended. Unless specifically shown otherwise on the Contract Drawings or stated in the Contract Specifications, embedded conduits shall be in accordance with the following criteria:
1. Minimum concrete thickness shall be as follows:
 - a. For concrete 16 inches thick and less, the minimum concrete thickness shall be 11.5 inches plus the depth of the largest conduit assembly. The conduit assembly depth shall be from the top of the uppermost conduit to the bottom of the lowest conduit.
 - b. For concrete greater than 16 inches thick, the minimum concrete thickness shall be 13.5 inches plus the depth of the largest conduit assembly.
 - c. For concrete at foundation slabs, an additional inch shall be added to the minimum concrete thicknesses previously stated.
 2. Conduit spacing shall be as follows:
 - a. Conduits shall be separated three times outer diameter of larger conduit center to center.
 - b. For multiple conduit layer assemblies, conduits shall be separated vertically three times outer diameter of larger conduit center to center.
 - c. When conduits cross at a given point, the conduits may be in direct contact and the angle of cross shall be 45 degrees or greater. Conduits may also cross within the vertical spacing of a multi-conduit layer assembly.
 - d. When conduits cross a structural expansion joint, conduits shall be separated three times outer diameter of larger conduit fitting center to center.
- H. A run of conduit between outlet and outlet, between fitting and fitting or between outlet and fitting shall not contain more than the equivalent of three quarter bends, including those bends located immediately at the outlet or fitting.
- I. Factory-made conduit bends or elbows shall be used wherever possible in making necessary changes in direction. Field bends shall be carefully made so as to prevent conduit damage or reduction in the internal areas. The radius shall not be less than six times the nominal diameters for the conduit with carefully matched bends on parallel runs so as to present a neat appearance.
- J. All conduits, where cut, shall be carefully reamed to remove burrs. No running threads will be permitted. All screw joints shall be watertight. Conduits shall be fitted in an approved manner to all devices and boxes. The ends of all conduits shall be equipped with suitable approved conduit fittings. The ends of all empty conduits shall stub up six inches above the slab and shall be capped.
- K. All conduits shall be carefully cleaned before and after installation and all inside surfaces shall be free from all imperfections likely to injure the cable. Conduits shall be cleaned in accordance with the following:

CONTRACT No. 22-523
DIVISION 26 - ELECTRICAL

1. After erection of complete conduit runs, conduits shall be snaked with a suitable swab to which shall be attached an approved tube cleaner equipped with an approved cylindrical mandrel of a diameter not less than 85 percent of the nominal diameter of the conduit.
 2. All conduits through which the mandrel will not pass shall be removed and replaced by the Contractor at his own expense.
 3. After snaking, the ends of the dead-ended conduits shall be protected with standard malleable iron caps to prevent the entrance of water or other foreign matter.
 4. Conduit ends shall be protected after cleaning with caps to prevent entrance of water, concrete, debris, or other foreign substance.
- L. As far as practicable, conduits shall be pitched to drain to outlet boxes or otherwise so installed as to avoid trapping moisture. Trapped conduits in concealed construction shall be provided with outlet boxes for drainage. Where necessary drainage in outlet boxes or where dips are unavoidable in exposed conduits, a drain fitting shall be installed at the low point.
- M. Thruwall type seals and conduit sealing bushings shall be installed for all conduits passing through concrete slabs, floors, walls, or block walls.
- N. Conduit runs shall be installed so as to avoid flues, heat sources, and steam or hot water pipes. A minimum separation of 12 inches shall be maintained where conduit crosses or parallels hot water, steam pipes or heat sources.
- O. Where conduit enter or leave equipment located within electrical and control rooms the conduit shall be sealed and packed with a suitable duct seal compound.
- P. A 250-pound tested polyethylene pull tape shall be provided in all empty conduits, with a minimum 8 inch of slack, double backed into the conduit. Conduit shall be protected immediately after installation by installing flat non-corrosive metallic discs and steel bushings designed for this purpose at each end. Discs shall not be removed until it is necessary to clean the conduit.
- Q. All conduit that is cut on the job shall be cut square and taper reamed to remove burrs before installation. Where steel conduit is cut and threaded on the site, it shall be coated before and after making connections.
- R. Conduits embedded in concrete shall stub up 6 inches above the slab. A three-inch-high curb extending three inches from the outer surface of the conduit penetrating the floor shall be provided to prevent corrosion. Conduit stub-ups shall be terminated in couplings, slightly above the finished concrete curb.

3.3 CONDUIT CONNECTIONS TO EQUIPMENT

- A. At each motor, electrical control device or other electrically controlled or operated equipment, the Contractor shall install a complete conduit connection between the conduit system and the terminal box of the motor or the conduit connection point of the equipment.
- B. Conduits installed in the conduit system shall be terminated in such locations as to permit direct connections to motors, devices, or equipment.
- C. Connections shall be made with rigid conduit if equipment is fixed and not subject to adjustment, mechanical movement, or vibration. Rigid connections shall be provided with union fittings to permit removal of equipment without cutting, breaking, or burning conduit.

- D. Motors, transformers, and equipment subject to adjustment, mechanical movement or vibration shall be connected with flexible metallic conduit.
- E. Flexible conduit connections shall be watertight.

3.4 INSTALLATION OF BOXES AND FITTINGS

- A. All concealed outlet boxes shall be set in such a manner that they will be plumb and flush with the finished surface.
- B. Boxes shall be installed rigidly and securely to the structure. Independent supports shall be provided where no walls or other structural surface exists.
- C. Expansion and expansion/deflection fittings shall be installed where conduits cross structural expansion joints and at locations shown on the Contract Drawings. Fittings shall be installed on each conduit and incorporated into the expansion joints of structures, at right angles to the joint, to insure their proper functioning and preservation.
- D. Expansion fittings shall be installed on exposed conduit runs exceeding 200 feet. Unless specifically shown otherwise on the Contract Drawings or stated in the Contract Specifications, when crossing structural expansion joints larger than one inch, an expansion fitting shall also be installed together with an expansion/deflection fitting. The fittings shall be installed on each conduit run in accordance with manufacture's recommendations to provide the additional movement necessary.
- E. All conduit connections in outdoor locations shall be made up watertight and shall terminate at enclosures with an approved conduit hub.
- F. All conduit connections in indoor locations shall terminate at enclosures with bushings and lock nuts. Terminations shall include one bushing and two lock nuts at each location. Lock nuts shall be installed one inside and one lock nut outside the enclosure. All conduits shall be bonded to the safety ground.
- G. At pull and junction boxes having any box dimension in excess of 18 inches, jumper type grounding bushings shall be installed on conduit ends and jumper wires shall be installed to bond all conduits and to bond conduits to boxes.
- H. All insulated grounding bushings shall be bonded together and to the structure of the enclosure by a continuous, copper bonding wire.
- I. Removable, flame-retardant, insulating cable supports shall be provided in all boxes with any dimension exceeding 3 feet.

3.5 FIELD TESTS

- A. After installation, the electric conduit system shall be field tested. The field tests shall be witnessed by the Engineer and certified by the Contractor. The Contractor shall provide testing consisting of the following:
 - 1. Each conduit shall be tested by pulling through a cylindrical mandrel as specified under this Section. Maintain a record of all conduits testing clear.
 - 2. Conduit systems shall be ground tested in the presence of the Engineer, who will inspect all enclosures, pull and junction boxes for bonding to the safety green conductor pulled with the nominal 120 volt and higher power and control circuits, and for bonding of the conduit grounding bushing to this safety ground.

CONTRACT No. 22-523
DIVISION 26 - ELECTRICAL

3. The separation of above safety grounding system from the instrumentation signal grounding shall be verified.
- B. The Contractor shall provide a Field Test Report. The Report shall identify the testing performed and the results obtained.

-END OF SECTION-

SECTION 26 18 13 – FUSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Requirements for providing fuses. Fuses shall be provided in accordance with the requirements specified under this Section, the Contract Specifications, and the Contract Drawings.
2. The fuses required under this Section shall be low-voltage classes. The fuses of each class shall be suitable for use with power circuits.

B. Related Sections:

1. Section 26 05 01 – Electrical – General Provisions

1.2 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. Manufacturer's catalog cuts for the fuses proposed for use with specifications and other data required to demonstrate compliance with the specified requirements.
2. Time - current curves for the fuses proposed for use.

1.3 REFERENCES

A. Fuses shall comply with the latest applicable provisions and recommendations of the following:

1. UL 248 - Low-voltage Fuses

1.4 QUALITY ASSURANCE

A. Low-voltage fuses shall be designed, built, and tested in accordance with UL 248. Low-voltage fuses shall be UL listed by class.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Fuses shall be delivered, stored, and handled in accordance with the manufacturer's recommendations.

1.6 SPARE PARTS

A. The Contractor shall furnish and deliver to the Engineer, at that part of the site and at such time as the Engineer may direct, spare fuses in accordance with the Contract Specifications.

- B. The spare fuses shall be listed in an index and packed in containers suitable for long term storage, bearing labels clearly designating the manufacturer's part number with complete information for use and reordering.
- C. Spare fuses shall include at a minimum the following:
 - 1. Low-voltage fuses, 10 percent of each rating used. Minimum of three of each rating.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Low-voltage fuses shall be as manufactured by:
 - 1. Eaton Bussmann, Ellisville, MO
 - 2. Mersen Ferraz Shawmut, San Francisco, CA.
 - 3. Littlefuse, Chicago, IL
 - 4. Or approved equal.

2.2 FUSES

- A. General:
 - 1. Fuses shall be provided with a voltage class suitable for the intended service. Fuses shall be compatible with the system operating voltage shown on the Contract Drawings.
 - 2. Low-voltage fuse ampere ratings shall be as shown on the Contract Drawings.
- B. Low-voltage Fuses:
 - 1. Low-voltage fuses shall be current limiting, time delay type. Low-voltage fuses shall have a 200,000 RMS symmetrical ampere interrupting rating.
 - 2. Low-voltage fuses with current ratings up to 600 amperes shall be UL class RK1.
 - 3. Low-voltage fuses with current ratings greater than 600 amperes shall be UL class L.

PART 3 - EXECUTION

3.1 INSTALLATION

- 1. Fuses shall be installed within equipment in accordance with the manufacturer's recommendations.

-END OF SECTION-

SECTION 26 22 13 – LOW VOLTAGE DISTRIBUTION TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Requirements for providing individually mounted dry type transformers. Dry type transformers shall be provided in accordance with the requirements specified under this Section, the Specifications, and the Contract Drawings.

B. Related Sections:

1. Section 26 05 29 – Hangers and Supports
2. Section 26 05 26 – Grounding Systems
3. Section 26 05 21 – Labeling and Identification

1.2 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. Manufacturer's catalog cuts for the transformers proposed for use.
2. Dimensional drawings showing transformer details with diagrammatic nameplate.
3. Transformer anchorage and mounting details prepared and stamped by a licensed engineer.
4. Description of shop and field-testing methods, procedures and apparatus with calibration dates shall be submitted. Testing methods and procedures shall be submitted at least 60 days in advance prior to conformation of witness testing dates and actual testing.

B. Shop test and field test reports shall be submitted.

C. Operations and Maintenance Manuals shall be submitted in accordance with the Specifications.

1.3 REFERENCES

A. Dry type transformers shall comply with the latest applicable provisions and recommendations of the following:

1. NEC – National Electrical Code.
2. NYSBC - New York State Building Code.
3. UL 1561 - Dry-Type General Purpose and Power Transformers.
4. NEMA ST 20 - Dry Type Transformers for General Application.
5. NIST - US National Institute of Standards and Technology.

1.4 QUALITY ASSURANCE

A. General:

1. All transformers shall conform to the applicable NEMA, ANSI and IEEE Standards and shall be built by one approved manufacturer who shall use only best commercial materials and processes of manufacture.
2. Transformer enclosures shall have ample room for primary and secondary wiring connections.
3. All transformers shall be UL listed and certified to ANSI/NEMA sound levels.
4. The transformer manufacturer shall use a shop test facility that has recently calibrated testing apparatus and qualified, experienced technicians, for all shop tests. Calibration of testing apparatus shall be within one year of date of testing.
5. All test equipment and instrument calibration shall be in accordance with the latest edition of the accuracy standard of the U.S. National Institute of Standards and Technology. Calibration of testing apparatus shall be within one year of date of testing.

B. Seismic Requirements

1. The transformer mounting system shall be designed, constructed and installed suitable for earthquake regulations in accordance with the seismic requirements of the NYCBC.
2. Transverse and longitudinal bracing shall be provided as required to brace the transformer for the seismic requirements specified.

C. Field testing of the transformers shall be performed in accordance with the requirements specified under this Section.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Dry type transformers shall be delivered, stored and handled in accordance with this Section, the Specifications and the manufacturer's recommendations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Dry type transformers shall be as manufactured by:

1. General Electric Company, Stamford, CT.
2. Or approved equal.

2.2 MATERIALS / EQUIPMENT

A. Transformers

1. General purpose transformers shall be of the dry, commercially quiet, low temperature rise type consisting of two windings per phase.

CONTRACT No. 22-523
DIVISION 26 - ELECTRICAL

2. Transformers shall have kVA rating, primary voltage and connection, secondary voltage and connection and number of phases as shown on the Contract Drawings.
3. Conductors for transformer windings shall be copper only.
4. Transformers shall be suitable for outdoor/marine environment installation in accordance with the locations shown on the Contract Drawings.
5. Transformer insulation shall be rated 220 degrees C, 80 degrees C rise.
6. Transformers shall be equipped with six 2-1/2 percent fully rated taps, two above and four below the rated voltage tap on the primary winding.
7. The arrangement, assembly, and laminations of the core shall be such as to facilitate repair to the windings.
8. The design, shape, and arrangement of windings shall allow free flow of air for insulation and cooling.
9. Transformer shall be totally enclosed non-ventilated type with NEMA 3RX enclosure.
10. Provide bonding/grounding bar affixed to the bottom panel in compliance with NEC 450.10(A).

2.3 SOURCE QUALITY CONTROL / SHOP TESTS

A. Shop Tests

1. Shop tests shall be performed at the transformer's manufacturer's plant prior to shipment.
2. Shop tests shall demonstrate that the equipment tested conforms to the requirements specified.
3. Each transformer shall be given a routine test in accordance with the latest requirements of UL, ANSI and NEMA standards.
4. The Contractor shall provide a shop test report. The report shall identify the tests performed and the results obtained.
5. Transformer shop tests shall be performed consisting of the following:
 - a. Applied potential shall be performed.
 - b. Induced potential shall be performed.
 - c. No load losses shall be performed.
 - d. Voltage ratio shall be performed.
 - e. Polarity shall be performed.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Transformers shall be installed on one inch of Korfund sound absorber material on raised concrete base at locations shown on the Contract Drawings.
- B. Sufficient access and working space shall be provided for ready and safe operation and maintenance.
- C. Transformers mounting, supports and restraints shall conform to the requirements of this Section and Section 26 05 29 – Hangers and Supports for Electrical Equipment.

CONTRACT No. 22-523
DIVISION 26 - ELECTRICAL

- D. Transformers shall be grounded in accordance with the requirements of Section 26 05 26 – Grounding and as shown on the Contract Drawings.
- E. The transformer leads shall be provided with solderless, clamp type cable connectors.
- F. Conduit runs shall be arranged for easy removal of the transformers.
- G. Transformer nameplates shall be installed for identification of equipment. Nameplates shall be provided in accordance with the requirements of Section 26 05 21 – Identification and Labeling

3.2 FIELD TESTING / QUALITY CONTROL

- A. Insulation resistance tests shall be performed on the transformers after installation.
- B. The tests shall be witnessed by the Engineer and certified by the Contractor. The tests shall be performed by the Contractor who shall furnish all testing equipment.
- C. The Contractor shall provide a field test report. The report shall identify the tests performed and the results obtained.

-END OF SECTION-

SECTION 26 24 16 – PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Requirements for providing panelboards. Panelboards shall be provided in accordance with the requirements specified under this Section, the Contract Specifications, and the Contract Drawings.
2. The panelboards shall include all power distribution, lighting, appliance, and instrument panels.

B. Related Sections:

1. Section 26 05 21– Labeling and Identification

1.2 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. Manufacturer’s technical information for the panelboards proposed for use including all components.
2. A listing of the panelboards with the number and size of circuit breakers identified.
3. Dimensional drawings showing panelboard enclosure details.
4. Panelboard anchorage details with design calculations signed by licensed Engineer.

B. Certificates of Compliance: Seismic qualification certification from the manufacturer including mounting recommendations.

C. Reports: Shop test reports shall be submitted.

D. Operations and Maintenance Manuals shall be submitted.

1.3 REFERENCES

A. Panelboards shall comply with the latest applicable provisions and recommendations of the following:

1. NEC – National Electrical Code.
2. UL Standard No. 50 - Enclosures for Electrical Equipment Non-Environmental Considerations.
3. UL Standard No. 50 - Enclosures for Electrical Equipment Environmental Considerations.
4. UL Standard No. 67 - Panelboards.
5. UL Standard No. 489 - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.
6. UL Standard No. 943 - Ground Fault Circuit Interrupters.
7. NEMA PB1 - Panelboards.

1.4 QUALITY ASSURANCE

A. General:

1. All panelboards shall conform to the applicable NEMA and UL Standards and shall be built by one approved manufacturer who shall use only best commercial materials and processes of manufacture.
2. The manufacturer shall have produced panelboards for a minimum of five years.
3. All panelboards shall be UL listed.
4. The panelboards manufacturer shall use a shop test facility that has recently calibrated testing apparatus and qualified, experienced technicians, for all shop tests. Calibration of testing apparatus shall be within one year.
5. All test equipment and instrument calibration shall be in accordance with the latest edition of the accuracy standard of the U.S. National Institute of Standards and Technology.

- B. The panelboards shall be designed, constructed, and installed suitable for earthquake regulations in accordance with the seismic requirements of the New York State Building Code.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Panelboards shall be delivered, stored, and handled in accordance with the manufacturer's recommendations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Panelboards shall be as manufactured by:

1. Eaton, Cleveland, OH
2. General Electric Company, Stamford, CT.
3. Or approved equal.

2.2 PANELBOARDS

A. General:

1. The panelboards shall be dead-front type with automatic trip-free, bolt-on, molded case circuit breakers.
2. The panelboards shall be equipped with main breakers or main lugs, branch circuit breakers, 1-pole, 2-pole, and 3-pole, as shown on the Contract Drawings.
3. Panelboard ratings shall be as shown on the Drawings. All panelboards shall be rated for the intended voltage. All panel boards shall be rated NEMA 12.

B. Ratings:

1. Panelboard ampacities, voltage, number of phases and wires shall be as shown on the Contract Drawings. Panelboard frequency shall be 60 Hz.

CONTRACT No. 22-523
DIVISION 26 - ELECTRICAL

2. Panelboards shall be labeled with a UL short circuit rating. All panelboards shall be fully rated.
 3. Panelboards rated 240VAC or less shall have a short circuit rating of 42,000A RMS symmetrical, unless shown otherwise on the Contract Drawings.
 4. Panelboards rated 480VAC shall have a short circuit rating of 35,000A RMS symmetrical, unless shown otherwise on the Contract Drawings.
- C. Cabinets:
1. Cabinets shall be constructed of 12-gauge galvanized steel with stainless steel hardware.
 2. Cabinets shall be NEMA 12 for indoor areas. Cabinets shall be NEMA 3R for outdoor areas.
 3. Cabinets shall have wiring gutters on the sides. Cabinets shall be at least 5-3/4 inches deep and 20 inches wide for panelboards with maximum branch circuit breakers of 100A. When branch circuit breakers are above 100A, cabinets shall be at least 9-1/2 inches deep and 31 inches wide.
 4. Trims for panelboards shall consist of a hinged trim door which does not leave any live parts uncovered and permits the operation of all circuit breakers. In addition, a door-in-door arrangement shall form the dead front panel door covering all parts not covered by the hinged trim door. Both doors shall have concealed hinges with flush type catches and locks. All locks shall be keyed alike.
 5. Cabinets shall have identifying nameplates in accordance with the requirements of Section 26 05 21 - Labeling and Identification.
- D. Bus Bars:
1. Bus bars shall be copper sized in accordance with UL standards to limit temperature rise on any current carrying part to a maximum of 65 degrees C above an ambient of 40 degrees C maximum.
 2. Bus bar taps for single-pole branches shall be arranged for sequence phasing of the branch circuit devices.
 3. A bonded ground bus shall be included in all panels.
 4. Full-size neutral bars shall be provided for panelboards, unless noted otherwise on the Contract Drawings.
 5. Where specifically shown on the Contract Drawings or stated in the Contract Specifications, panelboards shall be provided with a 200 percent rated neutral bus suitable for use with non-linear loads. Neutral busing shall have a suitable lug for each outgoing feeder requiring a neutral connection.
- E. Circuit Breakers:
1. Circuit breakers shall be the molded case type conforming to UL 489.
 2. Breakers shall be the heavy-duty, bolt-on type with quick-make quick-break toggle mechanism for manual as well as automatic operation.
 3. Breakers shall have 100-amp frames, with 15-amp trip elements as minimum, unless otherwise shown on the Contract Drawings. All 100-amp frame breakers shall be

fixed thermal magnetic trip units. Frame sizes above 100 amp shall have interchangeable thermal magnetic trip units or electronic trip units.

4. Where specifically shown on the Contract Drawings or stated in the Contract Specifications, breakers shall be provided with electronic trip units. Electronic trip units shall provide long time, short time, instantaneous and ground fault settings, and time adjustments as minimum.
 5. Where specifically shown on the Contract Drawings or stated in the Contract Specifications, ground fault circuit interrupters shall be provided. Ground fault breakers shall be equipped with solid state sensing and 5 milliamp sensitivity.
 6. Breakers used for lighting circuit switching shall be suitable for the purpose and shall be marked "SWD". Breakers requiring continuous operation shall be provided with a lock-on device.
 7. Where specifically shown on the Contract Drawings or stated in the Contract Specifications, shunt trips, bell alarms, and auxiliary devices shall be provided.
- F. Panelboard Metering:
1. Where stated in the Contract Specifications or shown on the Contract drawings UL listed microprocessor metering unit (MU) shall be installed in the panelboard.
 2. The MU shall have the capability to monitor all the panelboard outgoing and spare circuits including capacity for an additional twenty percent spare circuits.
 3. The MU shall be able to monitor and time stamp at a minimum the following per phase and line values for each circuit:
 - a. Voltage, Current, Power, Power Factor, VAR, and Frequency.
 - b. Watt Hour and Var Hour both forward and reverse.
 4. The MU shall be able to auto-detect sensor rating
 5. The MU shall store the energy profile for each circuit in a non-volatile memory for a minimum of one year. The demand interval shall be 15 minutes.
 6. MU communications ports and protocols shall be consistent with those adopted for the site or facility and shall be as stated in the Contract Specifications or as shown on the Contract Drawings.
- G. Surge Protection:
1. The panelboard shall be provided with surge protective devices complying with Section 26 35 00 – Power Filters and Conditioners.
- H. Directories:
1. Each panel shall be provided with a directory. Panel directories shall be typewritten and shall have designations of each branch circuit. The directory shall be protected by a glass or noncombustible plastic cover.
 2. The Contractor shall maintain in each panel, during the duration of the Contract, a handwritten directory clearly indicating the circuit breakers in service and the number of spares. This directory shall be updated as work progresses, and final, typewritten directories shall be provided at the end of the Contract.
 3. Where execution of the work under this Contract requires certain circuits to be modified, the Contractor shall update the panelboard directories if available to reflect the modifications. Final typewritten directories shall be provided at the end of the Contract.

2.3 PAINTING

- A. All metal surfaces of the panelboard enclosures shall be thoroughly cleaned and given one coat of zinc chromate primer. All interior surfaces shall then be given one shop finishing coat of a nitro-cellulose enamel lacquer.
- B. All exterior surfaces shall be given three coats of the same lacquer. The color of finishing coats shall be light gray ANSI No. 61.

2.4 SHOP TESTS

- A. Shop tests shall be performed at the panelboard's manufacturer's plant prior to shipment. Shop tests shall demonstrate that the equipment tested conforms to the requirements specified.
- B. Each panelboard shall be given a 60 Hertz, AC, Hi-Pot test, phase to phase and phase to ground, at twice rated voltage plus 1000 volts for one minute, 1500 volts minimum.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Panelboards shall be mounted rigidly and securely to the building structure or to supporting devices which are rigidly and securely supported to the building structure.
- B. Anchor panelboards to satisfy seismic requirements in accordance with the anchorage details.
- C. Panelboards shall be fastened with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screws or welded studs on metal.
- D. Mount all panelboards parallel or perpendicular to walls, such that panelboards are installed in a neat and professional manner.
- E. All wiring shall be neat within the panelboards. Wires shall be run vertically in the wire gutter and then terminate horizontally at a breaker.
- F. The Contractor shall install blanking devices within panelboard spaces, so bus bars are not exposed.
- G. Install panelboard nameplates for identification of equipment.
- H. Panelboard circuits shall be installed so to balance the loads on each of the panelboards.

-END OF SECTION-

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SECTION 26 27 26 – WIRNG DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Requirements for providing wiring devices. Devices shall be provided in accordance with the requirements specified under this Section and the Contract Drawings.

B. Related Sections:

1. Section 26 05 26 – Grounding Systems
2. Section 26 05 21 - Labeling and Identification
3. Section 26 05 33 - Electrical Raceway Systems

1.2 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. A list of proposed manufacturers with the products they produce proposed for the contract.
2. Manufacturer's catalog cuts and drawings showing all technical information, and construction details for all wiring devices including dimensions, type of wiring, weight, size, and installation methods.

B. Scaled Shop drawings showing the locations of all devices. The Drawings shall include the proposed routing of the branch circuits.

1.3 REFERENCES

A. Wiring devices shall comply with the latest applicable provisions and recommendations of the following even if not specifically listed in this Section:

1. NEC – National Electric Code
2. NYCECC - New York State Energy Conservation Code
3. UL 20 - General Use Snap Switches.

1.4 QUALITY ASSURANCE

A. The Contractor shall be responsible for reviewing all Contract drawings and coordinating with all trades the installation of wiring devices. Wiring device finishes and construction shall be compatible with the approved wall and ceiling types which shall be determined by the Contractor's review of all Contract drawings.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Wiring devices shall be delivered, stored, and handled in accordance with the manufacturer's instructions.

PART 2 - PRODUCTS

2.1 RECEPTACLES AND SWITCHES

A. General:

1. Receptacles and switches shall be provided in accordance with the Contract Specification and as shown on the Contract Drawings. The receptacles and switches shall be complete and shall include all accessories for proper installation.
 2. Outlet boxes for receptacles and switches shall be in accordance with Section 26 05 33 – Electrical Raceway Systems.
- A. Wall switches shall be heavy duty, specification grade, toggle action, flush mounting quiet type. All switches shall conform to the latest revision of Federal Specification WS 896. Wall switches shall be suitable for the area classification indicated and shall be of the following types and manufacturer:
1. Single pole, 20 Amp, 120/277 Volt - Cooper Wiring Devices; Hubbell Wiring Devices-Kellems; Pass & Seymour, Inc. or approved equal.
 2. Double pole, 20 Amp, 120/277 Volt - Cooper Wiring Devices; Hubbell Wiring Devices-Kellems; Pass & Seymour, Inc. or approved equal.
 3. Three way, 20 Amp, 120/277 Volt - Cooper Wiring Devices, Hubbell Wiring Devices-Kellems; Pass & Seymour, Inc. or approved equal.
 4. Four way, 20 Amp, 120/277 Volt - Cooper Wiring Devices; Hubbell Wiring Devices-Kellems; Pass & Seymour, Inc. or approved equal.
 5. Single pole, 20 Amp, 120/277 Volt - key operated, Cooper Wiring Devices; Hubbell Wiring Devices-Kellems; Pass & Seymour, Inc. or approved equal.
- B. Receptacles shall be heavy duty, specification grade of the following types and manufacturer or approved equal. Receptacles shall conform to Fed Spec WC596-F.
1. Duplex, 20 Amp, 125 Volt, 2 Pole, 3 Wire; Cooper Wiring Devices; Hubbell Wiring Devices-Kellems; Pass & Seymour, Inc. or approved equal.
 2. Weatherproof/corrosion resistant single, 20 Amp, 125 Volt, 2 Pole, 3 Wire, with cover; Crouse-Hinds Co., Catalog No. WLR5-5-20; Appleton Electric FSKJ520; Pass & Seymour or approved equal.
 3. Weatherproof/corrosion resistant duplex, 20 Amp, 125 Volt, 2 Pole, 3 Wire, with cover; Crouse-Hinds Co., Catalog No. WLRD-5-20; Appleton Electric FSKD520; Pass & Seymour or approved equal.
 4. Ground fault interrupter, duplex, 20 Amp, 125 Volt, 2 Pole, 3 Wire, GFCI feed thru type with "test" and "reset" buttons. Cooper Wiring Devices; Hubbell Wiring Devices-Kellems; Pass & Seymour, Inc. or approved equal.
 5. Duplex, 20 Amp, 125 Volt, 2 Pole, 3 Wire, transient voltage surge suppressor and audio alarm or indicating light to indicate bad ground or failed MOV. Cooper Wiring Devices; Hubbell Wiring Devices-Kellems; Pass & Seymour, Inc. or approved equal.

CONTRACT No. 22-523
DIVISION 26 - ELECTRICAL

6. Single, "power lock", 20 Amp, 125 Volt, 2 Pole, 3 Wire; Cooper Wiring Devices; Hubbell Wiring Devices-Kellems; Pass & Seymour, Inc. or approved equal.
7. Single, 20 Amp, 250 Volt, 2 Pole, 3 Wire; Cooper Wiring Devices; Hubbell Wiring Devices-Kellems; Pass & Seymour, Inc. or approved equal.
8. Single twist-lock, 30 Amp, 125 Volt, 2 Pole, 3 Wire; Cooper Wiring Devices; Hubbell Wiring Devices; Pass & Seymour, Inc. or approved equal.
9. Single twist-lock, 20 Amp, 250 Volt, 2 Pole, 3 Wire; Cooper Wiring Devices; Hubbell Wiring Devices; Pass & Seymour, Inc. or approved equal.
10. Single twist-lock, 30 Amp, 250 Volt, 2 Pole, 3 Wire; Arrow-Hart, Catalog No. 6340; plug: Arrow-Hart, Catalog No. 6342, similar by Harvey Hubbell, Inc.; Pass & Seymour, Inc. or approved equal.

C. Device Plates

1. Plates for indoor flush mounted devices shall be of the required number of gangs for the application involved and shall be as follows:
 - a. Administration type buildings: Smooth, high impact nylon of the same manufacturer and color as the device. Final color shall be as selected by the Architect during submittal review.
 - b. Where permitted in other areas of the building, flush mounted devices in cement block construction shall be Type 302 high nickel (18-8) stainless steel of the same manufacturer as the devices.
2. Plates for indoor surface mounted device boxes shall be cast metal of the same material as the box, Crouse-Hinds No. DS23G and DS32G; Appleton FSK1DRC, FSK1TSEC; Pass & Seymour or approved equal.
3. Oversized plates shall be installed where standard plates do not fully cover the wall opening.
4. Device plates for switches mounted outdoors or indicated as weatherproof shall be gasketed, cast aluminum with provisions for padlocking switches "On" and "Off", Crouse Hinds No. DS185; Appleton FSK1VS; Pass & Seymour or approved equal.
5. Multiple surface mounted devices shall be ganged in a single, common box and provided with an adapter, if necessary, to allow mounting of single gang device plates on multigang cast boxes.
6. Engraved device plates shall be provided where required.
7. Weatherproof, gasketed cover for GFI receptacle mounted in a FS/FD box shall be Cooper Crouse-Hinds; RACO (Hubbell); Pass & Seymour, Inc. or approved equal.

PART 3 - EXECUTION

3.1 RECEPTACLES AND SWITCHES:

- A. Receptacles and switches shall be installed within outlet boxes at locations indicated on the Contract Drawings and in accordance with code requirements.
- B. Receptacles shall be mounted 2 feet above the finished floor, except in hazardous locations where receptacles shall be mounted 4 feet-6 inches above the finished floor.
- C. Switches shall be mounted 4 feet 6 inches above the finished floor.

CONTRACT No. 22-523
DIVISION 26 - ELECTRICAL

- D. Where devices are grouped, they shall be mounted under a common plate. Where directed or where space conditions limit gang mounting, tandem or tandem gang arrangement shall be provided.
- E. Where four or more switches controlling fixtures that are not visible from the switch location are grouped, the switch plate shall be engraved and filled with colored material or otherwise suitably marked to designate the control of each switch.

3.2 FIELD TESTS

- A. After installation, the completed receptacle devices shall be field tested for operation and conformance. The field tests shall be witnessed by the Engineer and certified by the Contractor. The Contractor shall provide testing consisting of the following:
 - 1. Wiring continuity test shall be performed.
 - 2. Branch circuit load balance test shall be performed.
 - 3. Receptacle polarity and grounding.
- B. The Contractor shall provide a field test report. The report shall identify the test performed and the results obtained.

-END OF SECTION-

SECTION 26 28 23 – LOW VOLTAGE ELECTRIC CONTROL EQUIPMENT AND DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Requirements for providing electric control equipment. Electric control equipment shall be provided in accordance with the requirements specified under this Section and the Contract Drawings.

1.2 SUBMITTALS

A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited to:

1. Manufacturer's catalog cuts, technical information and enclosure details for the electric control equipment.

B. Operations and Maintenance Manuals shall be submitted.

1.3 REFERENCES

A. Electric control equipment shall comply with the latest applicable provisions and recommendations of the following:

1. NEC – National Electrical Code
2. UL Standard No. 98 - Enclosed and Dead-Front Switches
3. UL Standard No. 508 - Industrial Control Equipment
4. UL Standard No 489 - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit Breaker Enclosures.
5. NEMA Standard KS-1 - Heavy Duty and Dead-Front Enclosed Switches

1.4 QUALITY ASSURANCE

A. Unless otherwise shown on the Contract Drawings, stated in the Contract Specifications or directed by the standards and codes referenced under this Section, the Contractor shall provide for each low voltage motor or other power device, complete equipment for starting and control.

B. The starting and control equipment shall be provided with features of protection, current limitation and functioning and be complete with all accessories, appurtenances and supporting structures.

C. Control equipment shall be UL listed and properly designed with relation to the characteristics of operation of the motor and or device controlled.

- D. Unless otherwise shown on the Contract Drawings or stated in the Contract Specifications, each motor shall be provided with control equipment consisting of apparatus as follows:
1. Motors of 1/4 HP or less may, in the absence of other requirements, shall be controlled by a manual motor starter having thermal overload protection at all times.
 2. Motors larger than 1/4 HP shall be controlled by a magnetic motor starter.
 3. For wound rotor motors of all horsepower ratings, the primary and secondary shall be controlled by a magnetic motor starter or as stated in the Contract Specifications.
 4. Multiple speed squirrel cage motors, shall be controlled by a magnetic motor starter. The magnetic motor starter shall provide adequate protection of the motor at each speed. A line establishing contactor shall be provided for each motor speed.
- E. Each motor shall include overload protection based on latest standards.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Electric control equipment shall be delivered, stored and handled in accordance with the manufacturer's instructions.

1.6 SPARE PARTS

- A. The Contractor shall furnish and deliver to the Engineer, at that part of the site and at such time as the Engineer may direct, spare parts for the electric control equipment in accordance with the Contract Specifications.
- B. The spare parts shall be listed in an index and packed in containers suitable for long term storage, bearing labels clearly designating the manufacturer's part number with complete information for use and reordering.
- C. The following spare parts shall be furnished:
1. One (1) set of contact tips, shunts and coils shall be provided for each 6 or less of each size motor starter.
 2. One (1) auxiliary contact unit or one set of auxiliary contact tips shall be provided for each 6 or less motor starter.
 3. Two (2) sets of arc chutes shall be provided for each type and rating of magnetic contactor.
 4. One (1) timing relay shall be provided of each type installed as part of control equipment installation.
 5. One (1) complete auxiliary relay shall be provided of each type installed as part of control equipment installation.
 6. One (1) control transformer shall be provided of each rating and type installed as part of control equipment installation.
 7. Two (2) complete sets of fuse replacements shall be provided of each rating and type installed as part of control equipment installation.

PART 2 - PRODUCTS

2.1 SWITCHING DEVICES

- A. Switching devices shall be low-voltage devices provided in accordance with the details shown on the Contract Drawings. The switching devices required under this Section shall be the disconnect switch and circuit breaker types.
- B. Switching devices shall be enclosed in NEMA type enclosures in accordance with the requirements specified under this Section.
- C. Switching device line and load terminals shall be provided with shields to prevent accidental contact with them. In addition, instrument probe holes shall be provided within the shields to permit investigation by authorized personnel and approved procedures of the state of the terminals.
- D. Disconnect switch type switching devices shall be in accordance with the following:
 - 1. Switches shall be heavy duty type with number of poles, voltage and current ratings as shown on the Contract Drawings.
 - 2. Switches shall be capable of interrupting the full rated current at full rated voltage.
 - 3. Switch enclosure shall be provided with a viewing window through which it shall be permissible to observe the state of the main contacts and surge protective devices when provided.
 - 4. Where specifically shown on the Contract Drawings, disconnect switches shall be complete with fuses, surge protective devices and remote operation.
 - 5. Switches shall be the quick make and quick break type covered with an arc resisting barrier. The switch shall be provided with provision for locking in either open or closed position. The ratings shall be as follows:

Switch Rating in Amperes	MOTOR HORSEPOWER	
	208-240V	480V
60	Over 5 to 15	Over 5 to 30
100	Over 15 to 25	Over 30 to 60
200	Over 30 to 50	Over 60 to 125
400	Over 50 to 75	Over 125 to 200

- E. Circuit breaker type switching devices shall be in accordance with the following:
 - 1. Circuit breakers shall be the molded case type with number of poles, voltage and current ratings as shown on the Contract Drawings.
 - 2. Breakers shall be manually or remotely operated thermal magnetic or solid-state type, including inverse-time overload and instantaneous short-circuit protection. Contacts

shall be nonwelding silver alloy and arc extinction shall be accomplished by means of arc chutes.

3. Breakers shall have 100-amp frames as a minimum. Overload protection shall be provided on all poles, with trip settings as shown on the Contract Drawings. Breakers with frame sizes 225 amp or larger shall have interchangeable trip units and adjustable magnetic trip elements.
 4. Breakers shall be operated by a toggle-type handle and shall have a quick-make/quick-break over-center switching mechanism that is mechanically trip-free. Automatic tripping of the breaker shall be clearly indicated by the handle position. Breaker enclosure shall be equipped with an external lockable handle with provision for locking in the closed or open position.
 5. Where specifically shown on the Contract Drawings or stated in the Contract Specifications, breakers shall be provided with electronic trip units. Electronic trip units shall include long time, short time, instantaneous and ground fault settings as minimum.
- F. Switching devices shall be as manufactured by:
1. Cutler-Hammer, Melville, NY.
 2. General Electric Company, Stamford, CT.
 3. Siemens, Washington, DC
 4. Or approved equal.

2.2 MAGNETIC MOTOR STARTERS

- A. Magnetic motor starters shall be provided complete with fused control power transformer, pilot devices, auxiliary contacts and accessories as shown on the Contract Drawings or stated in the Contract Specifications.
- B. Magnetic motor starters shall be enclosed in NEMA type enclosures in accordance with the requirements specified under this Section. The starter shall be combination type. The enclosure shall be equipped with an external operable, pad lockable handle, arranged so that it is impossible to open the door unless the breaker is open.
- C. The starter shall be magnetic coil operated and shall include a magnetic or solid state motor circuit protector with trip unit range adjustable from 700 to 1300 percent of full load. The combination starters shall be suitable for interrupting 65,000 amps through 480 volts.
- D. Magnetic contactors shall be 3 pole, single throw, 60 Hz with auxiliary contacts for under-voltage protection. Contactors shall be mounted upon steel bases with insulated mountings or upon bases of insulating material. Contactors shall be provided with necessary barriers and arc chutes.

E. Contactors shall be NEMA rated as follows:

NEMA Size of Contactor	MOTOR HORSEPOWER	
	208-240V	480V
1	¼ to 7½	¼ to 10
2	over 7½ to 10	over 10 to 25
3	over 15 to 25	over 25 to 50
4	over 30 to 40	over 50 to 100
5	over 50 to 75	over 100 to 200

F. Contactors in Sizes 1 through 4 shall have double break, silver to silver main contacts. Contactors in Size 5 shall have silver plated tips which close with rolling action and which have self-aligning and self-cleaning features. Auxiliary and interlocking contacts for all sizes shall be of the silver button type. All contact tips shall be easily renewable. Flexible shunts shall be tinned copper braid or tinned extra flexible copper cable.

G. Overload relays shall be of the ambient temperature compensated bi-metallic or solid state type with interchangeable sensors and manual reset feature. Relay shall include a normally open auxiliary contact for remote alarm purposes. Sensors for overload relays shall be selected to match full load currents of the motors to allow motor operation at maximum safe loads without damage to equipment. Full load current data shall be obtained from nameplates of motors actually installed.

H. Pilot devices shall be heavy duty type, rated 10 amp continuous. Pushbuttons, selector switches, indicating lights, and other devices shall be located on the starter enclosure. Indicating lights shall be push-to-test, LED, transformer type with 12-volt secondaries.

I. Relays shall be standard, latching type and pneumatic or solid-state time delay type. Relays shall be provided with contacts rated 10 amp with number as required.

J. Special overload protection shall be provided where definite purpose motors cannot be protected by standard thermal overload relay applications.

K. Magnetic motor starters shall be as manufactured by:

1. Cutler-Hammer, Melville, NY.
2. General Electric Company, Stamford, CT.
3. Siemens, Washington, DC.
4. Or approved equal.

2.3 MANUAL MOTOR STARTERS

A. Manual motor starters shall be provided complete with pilot devices as shown on the Contract Drawings or stated in the Contract Specifications.

CONTRACT No. 22-523
DIVISION 26 - ELECTRICAL

- B. Manual motor starters shall be enclosed in NEMA type enclosures in accordance with the requirements specified under this Section.
- C. Manual motor starters shall be toggle operated, NEMA horsepower rated, single phase type with thermal overload protection unless shown otherwise on the Contract Drawings or stated in the Contract Specifications. Pilot devices when required shall be in accordance with the requirements specified under this Section.
- D. Where shown on the Contract Drawings, manual motor starters shall be low-voltage, three phase type without overload protection for use as manual starting disconnect switches. The switches shall be NEMA size 0 or 1 horsepower rated, as required for the application intended.
- E. Manual motor starters shall be as manufactured by:
 - 1. Cutler-Hammer, Melville, NY.
 - 2. General Electric Company, Stamford, CT.
 - 3. Siemens, Washington, DC.
 - 4. Or approved equal.

2.4 CONTROL STATIONS

- A. Control Stations shall be provided in accordance with the details on the Contract Drawings.
- B. Control Stations shall be enclosed in NEMA type enclosures in accordance with the requirements specified under this Section.
- C. Control stations shall be industrial, heavy duty, oil tight construction with clearly marked legend plates. Stations shall have operating devices as shown on the Contract Drawings.
- D. Contact ratings shall be 10 amp minimum. All indicating lights shall be LED, transformer type, lens color shall be as shown on the Contract Drawings.
- E. Control stations shall be as manufactured by:
 - 1. Cutler-Hammer, Melville, NY.
 - 2. General Electric Company, Stamford, CT.
 - 3. Siemens, Washington, DC.
 - 4. Or approved equal.

2.5 ENCLOSURES

- A. Enclosures shall be provided for the electric control equipment. Enclosures located indoors in dry, dusty areas shall be gasketed and shall be constructed of 14-gauge sheet steel. Cabinet type enclosures shall include hinged and gasketed front doors.
- B. Enclosures shall be provided in accordance with NEMA requirements as required for the area classifications indicated on the Contract Drawings.
- C. For indoor locations, enclosures shall meet NEMA 12 requirements. For outdoor areas, enclosures shall meet NEMA 3R requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Equipment shall be mounted so that sufficient access and working space is provided for ready and safe operation and maintenance.
- B. Equipment shall be securely fastened to walls or other surfaces on which they are mounted. Independent supports shall be provided where no wall or other surface exists.
- C. Electric control equipment shall be installed in conformance with the National Electrical Code.

-END OF SECTION-

-NO TEXT ON THIS PAGE-

SECTION 26 30 00 – ELECTRIC MOTORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Requirements for providing electric motors. The electric motors shall be provided in accordance with the requirements specified under this section and the Contract Drawings

B. Related Sections:

1. Section 26 05 01 – Electrical – General Provisions

1.2 PERFORMANCE REQUIREMENTS

A. Specific motor data such as HP, RPM, enclosure type, shall be as stated in the specifications referencing this section. The specific motor data is specified under other specification sections for mechanical equipment with which the motor is supplied. The motor types specified under this section shall include:

1. Single Phase, alternating current, fractional horsepower induction motors.
2. Three Phase, alternating current, NEMA frame, squirrel cage, induction motors.
3. Three Phase, alternating current, above NEMA frame, squirrel cage, induction motors.
4. Three Phase, alternating current, submersible, squirrel cage, induction motors.
5. Three Phase, alternating current, wound-rotor, squirrel cage, induction motors.
6. Direct current, small motors.

B. Motors shall be designed, built, and tested in accordance with the latest applicable editions of ANSI/IEEE, NEMA, UL and NYCEC. The classifications, ratings, performance and testing of all motors shall be in accordance with the latest edition of NEMA Publication No. MG1.

C. Motors shall be of sufficient capacity to operate the driven equipment under all conditions of operation without loading the motors beyond their rated nameplates current and power under all operating conditions imposed by the driven equipment.

D. The rating of the motors offered shall in no case be less than the horsepower shown on the Contract Drawings or stated in the Contract Specifications. Both the rating and the characteristics of the motor shall be suitable for the successful operation of the driven equipment, under load conditions, within nameplates values of service factor and ambient temperatures.

E. Unless otherwise stated in the Contract Specifications, motors shall be of three phase construction for ratings above 1/3 horsepower and single phase construction for 1/3 horsepower or less.

F. All motors operating at 460 volts and below shall be of a type approved for starting characteristics and ruggedness as may be required under the actual conditions of operation. Unless otherwise stated in the Contract Specifications, motors shall be designed for full

voltage starting. When the motor is reduced voltage started, the motor shall develop ample torque for acceleration under the conditions imposed by the reduced voltage starting method.

- G. Multi-speed motors shall have a separate winding for each speed unless otherwise stated in the Contract Specifications.
- H. Portable devices shall have totally enclosed motors and approved cord with provisions for grounding. They shall be suitable for the available power supply.
- I. All motors shall be continuous time rated suitable for operation in a 40 degrees C ambient unless stated otherwise in the Contract Specification.
- J. Unless otherwise specified in the Contract Specifications motors shall be NEMA Premium® efficiency type and shall have nominal efficiencies in accordance with NEMA MG1. Motors with horsepower or RPM's not listed by NEMA shall conform to comparable standards of construction and materials as those for listed NEMA motors.
- K. Motors shall comply with the EPAct 1992 and EISA 2007.
- L. Variable-speed motors shall comply with NEMA MG1.
- M. Variable-speed motors operated from variable frequency drives shall comply with NEMA MG1.

1.3 SUBMITTALS

- A. Contractor shall submit Shop Drawings and material specifications for the approval of the Engineer. Submittals shall include, but not be limited, to:
 - 1. A list of proposed manufacturers with the products they produce proposed for the contract.
 - 2. For fractional horsepower motors, data sheets showing nameplate data shall be submitted.
 - 3. For motors rated one horsepower or greater, Motor Test Data Sheets shall be submitted. All values shall be from tests of previously manufactured, electrically duplicate motors or calculated data. Sheets shall be marked to indicate motor application location, manufacturer, type, frame size, bearing type, lubrication medium and enclosure type. Sheets shall include:
 - a. Winding resistances.
 - b. Torques.
 - c. Efficiencies.
 - d. Power factors.
 - e. Slip.
 - f. Full load.
 - g. Locked rotor and no load amperes.
 - h. Rotor voltage and amperes for wound rotor units.
 - i. Nameplates temperature and results of dielectric tests.
 - 4. An outline drawing or an outline data sheet showing complete motor dimensions shall be submitted to cover every motor rated greater than 1/3 horsepower. Several motors of the same type and rating for the same application may be covered by a single drawing or outline sheet. Drawings or sheets shall bear complete identifying data including frame size, speed, horsepower ratings and application for each particular unit.

5. Description of proposed shop and field testing methods, procedures and apparatus with calibration dates shall be submitted. Testing methods and procedures shall be submitted at least 45 days in advance prior to conformation of witness testing dates and actual testing.
 6. Qualifications of proposed testing firm to perform acceptance testing shall be submitted. Submit firm experience records at least 45 days in advance to actual testing, five recent references with phone numbers shall be submitted.
 7. All motor accessories, heaters, detectors, etc., shall be submitted.
- B. Certificates of Compliance:
1. Certified copies of motor characteristic curves and all other data necessary for establishing control and protective equipment settings shall be submitted.
 2. Results of shop tests shall be certified. When routine tests are made in conjunction with complete initial tests, unwitnessed results shall be certified and copies shall be submitted. Results shall be included for each test.
 3. Data and results of witness tests shall be submitted with copies of certified initial tests, accompanied by a certificate of authenticity sworn to before a notary public by an officer of the manufacturing company. Upon approval, release for shipment to site shall proceed and the Engineer shall be notified of the arrival date.
- C. Reports:
1. Shop test and field test reports shall be submitted.
 2. Manufacturer's site visit and acceptance testing reports shall be submitted.
- D. Operation and maintenance manuals shall be submitted in accordance with the driven equipment specific Specifications.

1.4 REFERENCES

- A. Electric motors shall comply with the latest applicable provisions and recommendations of the following:
1. EISA 2007 - Energy Independence and Security Act of 2007
 2. EPCA 1992 - Energy Policy and Conservation Act of 1992
 3. NEC – National Electrical Code.
 4. NEMA Standard MG1 - Motors and Generators.
 5. NEMA Standard MG 10 - Energy Management Guide for Selection and Use of Fixed Frequency Medium AC Squirrel-Cage Polyphase Induction Motors.
 6. UL Standard 674 - Electric Motors and Generators for use in Hazardous Locations.
 7. UL Standard 1004 - Electric Motors.
 8. AFBMA Standard 9 - Load Ratings and Fatigue Life for Ball Bearings.
 9. AFBMA Standard 11 - Load Ratings and Fatigue Life for Roller Bearings.
 10. API Standard 541 - Form-Wound Squirrel-Cage Induction Motors 375 kW (500 Hp) and Larger
 11. NETA ATS - Acceptance Testing Specifications.

1.5 QUALITY ASSURANCE

- A. General:
1. The motor manufacturer shall maintain a documented Quality Assurance Program implementing suitable procedures and controls to monitor all aspects of production

and testing. The Quality Assurance Program shall be the manufacturer's standard program specifically dedicated to ensure each motor is designed, assembled and tested in accordance with the requirements specified.

2. Motor manufacturer shall use a shop test facility that has calibrated testing apparatus, a dynamometer and qualified experienced technicians for all shop tests. Calibration of testing apparatus shall be within one year.
3. All test equipment, instrument calibration and test reports shall be in accordance with the latest edition of the accuracy standard of The U.S. National Institute of Standards and Technology and NETA acceptance testing specification.
4. Nameplates shall be provided for each motor. Nameplates shall clearly indicate information in accordance with NEMA requirements. Nameplates shall be engraved or embossed on stainless steel and fastened to the motor frame with stainless steel screws or drive pins.

B. Field Tests:

1. The motors shall be field tested. Field testing shall be performed in accordance with the requirements specified under this Section.
2. Retain the services of the motor manufacturer for field service. Field service shall be in accordance with the requirements specified under this Section.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Electric motors shall be delivered, stored and handled in accordance with the motor manufacturer's instructions and the following:

1. Motors shall be inspected for shipping damage when received.
2. All sleeve or oil lubricated bearings motors shall be identified and the bearing reservoirs filled to normal level.
3. Motors shall be handled using motor base lifting lugs. Avoid pounding or bumping of motor which may damage motor. A hoist and spreader bar arrangement shall be used to avoid damage.
4. Motors shall be stored indoors in clean, dry heated areas.
5. Motor space heaters shall be energized to prevent moisture condensation throughout the storage and construction period.

B. Motors shall not be stored in areas subject to continuous vibration. A small quantity of grease shall be injected into each bearing on a monthly basis. Purged grease shall be inspected for water or rust. Motor shaft shall be rotated by hand to check for binding.

1.7 SPARE PARTS

A. The Contractor shall furnish and deliver to the Engineer, at that part of the site and at such time as the Engineer may direct, spare parts for the electric motors in accordance with the Contract Specifications.

B. The spare parts shall be listed in an index and packed in containers suitable for long term storage, bearing labels clearly designating the manufacturer's part number with complete information for use and reordering.

C. Spare parts shall be furnished in accordance with the manufacturer's recommendations for the motor size and type. Spare parts shall include at a minimum the following:

1. One set of brushes shall be provided for each DC type motor and wound rotor type motor requiring them.
 2. One complete set of bearing linings, or renewable ball or roller bearings shall be provided for each three (or less) of each type and size of motor. Spare bearings shall be furnished for all motor types. When sleeve bearing motors are provided, spare oil rings shall be furnished for those motors.
 3. One complete assembly of brush holders and supports shall be provided for each size of DC type motor and wound rotor type motor requiring them.
 4. One complete assembly of collector rings shall be provided for each size of wound rotor type motor requiring them.
 5. One complete set of fans and guards shall be provided (per each set of three or less) for each size totally enclosed fan cooled type motor.
 6. One set of bearing temperature detectors shall be provided (per each set of three, or less) of each type of motor 250 horsepower and larger.
 7. One set of upper and outer seal assemblies shall be provided (per each set of three or less) for each size submersible type motor.
 8. One set of O ring kit shall be provided (per each set of three or less) for each size submersible type motor.
 9. One set of wear rings shall be provided (per each set of three or less) for each size submersible type motor.
- D. Lubricants: The Contractor shall furnish as part of the bulk lubricant order the quantity of lubricants required to operate and maintain the motors furnished under this section for a period of one year after acceptance. As a minimum, there shall be provided sufficient oil and grease to make a least one lubricant change for each motor as applicable. Replace all lubricants used during startup and testing prior to acceptance of equipment. Furnish this replacement lubricant in addition to the lubricants included in the bulk order.

PART 2 - PRODUCTS

2.1 SINGLE PHASE AC MOTORS

- A. Unless otherwise specified in the Contract Specifications, single phase motors shall be rated 115 or 230 volt, capacitor start. Small fan motors may be split-phase or shaded pole type if such are standard for the equipment.
- B. Bearings for single phase, open and enclosed motors shall be grease lubricated ball type with grease fittings or with lubrication for 10 years of normal operation.
- C. Motors shall be totally-enclosed except small fan motors may be open type if suitably protected from moisture, dripping water, and lint accumulation. Motor features shall be in accordance with the following:
 1. Open motors shall be split phase or capacitor start in accordance with torque requirements, 1.35 Service Factor, 40 degrees C Ambient Class B Insulation.
 2. Enclosed motors shall be capacitor start, fan cooled 1.15 service factor, 40 degrees C ambient, Class F, treated insulation. Enclosed motors shall be totally enclosed fan cooled, or non-ventilated. Enclosed motors shall be designed with cast iron end shields, neoprene gaskets, stainless steel shaft, heavy pressed steel fan cover and provision for threaded conduit connection.

3. Direct drive fan motors shall be shaded pole or permanent split capacitor, 1.35 service factor, 40 degrees C ambient.

2.2 THREE PHASE AC MOTORS

A. General:

1. Three phase motors shall be general-purpose squirrel cage induction type, designed for operation on a 3 phase, 60 hertz alternating current system. Motor voltage and where required adjustable frequency operation shall be as stated in the Contract Specifications and the Drawings.
2. Unless otherwise required by the load, all motors shall be NEMA Design B, normal starting torque. Locked rotor KVA/HP shall not exceed NEMA Code Letter G for 20 HP motors and larger.
3. The design of the stator, rotor and shaft shall be in accordance with the approved practice of leading manufacturers. The motor frame shall be a rigid structure, designed to maintain the lamination in correct alignment and shall not be dependent on the lamination or bolts for rigidity.
4. Motor rotors shall be of cast or fabricated aluminum or fabricated copper or copper alloy as required to meet the motor performance characteristics of slip, torque, and efficiency.
5. Unless otherwise specified in the Contract Specifications, three phase squirrel cage motors shall be totally enclosed.
6. Motors shall be stamped with a NEMA nominal efficiency rating in accordance with NEMA testing and marking standards MG1-12.54 and 12.55.

B. Bearings:

1. Horizontal motors shall be provided with either the rolling element (anti-friction) or sliding element (sleeve) type bearings. Anti-friction type bearings shall be used for all NEMA frame motors. Where greater power and speeds are required by the driven equipment, sleeve type bearings shall be used.
2. Bearings for 3 phase drip-proof, enclosed motors shall be grease lubricated, ball type. Bearings shall be fitted with inlet fittings and outlet plugs. Motor bearings and grease reservoirs shall be protected from the entry of contaminants.
3. Bearings for direct drive fan motor shall be of the oil lubricated sleeve type.
4. When anti-friction bearing are furnished on horizontal motors for ratings up to 500 horsepower and speeds to 3600 RPM they shall have a minimum bearing life of 100,000 hours as defined by AFBMA. Suitable fittings shall be provided to permit convenient positive purging of old grease during regreasing operation. Close running shaft seals shall prevent leakage of grease as well as prevent the entrance of foreign materials such as water and dirt into the bearing area. Motors equipped with anti-friction bearings shall have the appropriate AFBMA number stamped on a nameplate attached to the motor.
5. When furnished, sleeve bearings shall be ring-oiled with an adequate, integral self-cooled oil reservoir. The bearing sleeves shall be lined with a high tin content babbitt to minimize oil contamination. Close running shaft seals shall prevent oil leakage as well as prevent entrance of foreign material such as water and dirt into the bearing area. Oil level sight gages with permanently marked easily discernible oil level shall be provided. In addition, inspection openings to observe the oil rings shall also be provided.

6. When required by motor speed and bearing size, provision shall be made for forced lubrication. The oil supply shall be supplied with motor. In addition, oil rings and an adequate oil reservoir in the bearing housings shall be provided to permit orderly shutdown of the motor in the event of failure of the forced feed lubrication system.
7. Vertical motors shall be provided with thrust bearings adequate for all thrusts to which they can be subjected. The rated minimum life of the thrust bearings shall be at least 15,000 hours when operated at rated speed and full load thrust. The driven equipment manufacturer shall supply the motor manufacturer with the speed and thrust conditions required by the driven equipment.
8. Submersible motor bearings shall be permanently sealed and lubricated. Anti-friction guide and thrust bearings shall be replaceable. Bearings shall have a rated minimum life of 15,000 hours.

C. Insulation:

1. The insulation system for three phase AC motors shall be rated Class F, with a service factor of 1.15 times the nameplate horsepower rating when operated on a sine wave supply and a service factor of 1.0 on an adjustable frequency supply. Temperature rise shall be limited to Class B insulation system when motor is operated continuously at rated horsepower with an ambient temperature not exceeding 40 degrees C.
2. Windings shall be epoxy coated. The windings shall be thoroughly treated with approved insulating compound suitable for protection against moisture, salt air and slightly acid or alkaline conditions. The insulation system for enclosed motors shall be upgraded by additional dips and bakes to increase moisture resistance.
3. Motors for outdoor service shall have vacuum/pressure impregnated epoxy insulation (VPI) for moisture resistance. Motors shall be preheated before VPI and baked in a temperature controlled oven.
4. Motors applied in speed varying service and operated from variable frequency drives shall have an inverter grade insulation system designed and built in accordance with NEMA MG1 Part 31.
5. The stator windings and end turn connections shall be fully brazed to withstand full voltage starting regardless of the starting method indicated in the equipment driven Specifications. The bracing system shall essentially eliminate coil vibration under the high current conditions of starting as well as during normal operation. If a tied system is used, it shall be such that no tie depends on the integrity of any other tie within the system.

D. Enclosures:

1. Motors shall have a steel or cast iron frame and a cast iron or steel conduit box. For wound rotor motors separate boxes for stator and rotor connections shall be provided. For NEMA frame size motors cast aluminum frames and terminal boxes may be used.
2. Motor enclosures shall conform to the NEMA classifications specified and to the following:
 - a. Totally enclosed fan cooled and non-ventilated motors shall have a cast iron frame, cast iron end brackets and cast iron conduit box. Drain holes shall be provided on each end of motor.
 - b. Submersible motors shall be hermetically sealed, watertight with tandem mechanical seals suitable for continuous submergence.

3. Motor conduit box shall be split from top to bottom and shall be capable of being rotated to four positions. Motor conduit box shall be in accordance with the following:
 - a. Conduit box shall be gasketed and shall include rubber-like gaskets between the frame and the conduit box and between the conduit box and its cover.
 - b. Conduit boxes or openings in motor housings shall be provided with conduit hub type fittings to permit threaded conduit connections. Single phase and direct drive fan motors shall be provided with conduit fittings and leads to permit external connection.
 - c. Conduit box sizes shall be in accordance with code requirements. This shall include high-voltage terminations or stress cones. Protective and auxiliary devices, shall terminate in auxiliary conduit boxes for motors rated above 600 volt.
 - d. Terminal leads shall be flexible and shall be of sufficient length to extend for a distance of not less than ten inches beyond the face of the terminal box. Terminal leads shall be fitted with solder less lugs suitable for attachment to lugs installed on external wiring. Leads shall be sealed with a non-wicking, non-hygroscopic insulating material or an insulating "wrap-cap" as manufactured by Ideal Industries.
 - e. Provisions for terminal box size, length of leads, size of conduit openings and type of terminal lugs shall be complied with irrespective of any other standards or practice.
 - f. A motor frame grounding stud shall be provided inside the conduit box. A drilled and tapped hole shall be included.

2.3 DC MOTORS

A. General:

1. DC motors shall be designed and built in accordance with NEMA Standard MG1-12 for use on a full wave, single phase, rectified power supply.
2. DC motors shall be heavy duty, industrial SCR drive type, direct current. Motor construction shall be shunt-wound or permanent-magnet type as stated in the Equipment Driven Specifications.
3. DC motors shall provide a constant torque output over the operating speed range, with fixed shunt excitation and variable DC armature voltage.

B. Bearings shall be grease lubricated, double shielded, with shaft seals.

C. Insulation:

1. The insulation system for DC motors shall be Class F, with a service factor of 1.15 times the nameplate horsepower rating.
2. The windings shall be epoxy coated and include a thermostat protector. Thermostat shall be in accordance with the requirements specified under this Section.

D. Enclosures:

1. DC motor enclosure shall be totally enclosed fan cooled, or non-ventilated. The frame size shall be selected by the manufacturer to prevent overheating when continuously operated at low speeds.

2. When stated in the Equipment Driven Specifications, the motor enclosure shall be fitted with a factory mounted tachometer generator. The generator shall be C-face or flange mounted construction.

2.4 ACCESSORIES

A. General:

1. Motor accessories shall be provided in accordance with the requirements specified under this section unless otherwise stated in the Contract Specifications.
2. Each outdoor motor 5 horsepower and larger shall be provided with space heaters. 5 horsepower and larger enclosed motors installed indoors in damp, unheated spaces shall also be provided with space heaters.
3. Winding thermal protection, thermostat type shall be provided for each motor in accordance with the following:
 - a. Where indicated on the Contract Drawings.
4. Cranes, elevators, hoists, and other devices complying with special safety codes shall be furnished complete with their control equipment, and with all accessories and safety devices for approved safe and efficient operation.

B. Space Heaters:

1. Space heaters for condensation prevention shall be rated 120 volt. Wattage shall be suitable for the particular frame size and type in accordance with the manufacturer's recommendation.
2. Space heater wire leads shall be brought out to an auxiliary conduit box on the motor. Box construction shall match main power conduit box.

C. Winding thermal protection shall be in accordance with the following:

1. Thermostats shall be bi-metal disk or rod type embedded in the stator windings. Thermostat contacts shall be automatic reset type, rated 120 volt AC, 5 amps minimum opening on excessive temperature.

D. Single Phase Motors: Single phase motors requiring auxiliary starting resistors, capacitors or reactors and switching devices shall be furnished as combination units with such auxiliaries either incorporated within motor housings or housed in suitable enclosures, mounted upon motor frames. Each combination unit shall be mounted upon a single base and shall be provided with a single conduit box.

2.5 PAINTING

A. External Surfaces:

1. All motors shall have external surfaces pretreated, primed and painted in accordance with the manufacturer's standard treatment.

B. Internal Surfaces:

1. All motors shall have internal surfaces pretreated and primed in accordance with the manufacturer's standard treatment.

C. All machined bolts and screws and other hardware shall be of the hex head type and shall be zinc plated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Motors shall be installed in accordance with manufacturer's instructions and recommendations.
- B. Each motor shall be carefully and properly aligned with the driven equipment.
- C. Equipment shall be secured to mounting surface with anchor bolts. Anchor bolts shall be provided meeting manufacturer's recommendations and of sufficient size and number to secure equipment.
- D. Motor nameplates shall be installed for identification of equipment. Nameplates shall be provided in accordance with the requirements of Section 26 05 21 – Labeling and Identification.

3.2 FIELD TESTS

- A. After installation, motors shall be field tested for operation and conformance. The Contractor shall perform field tests in accordance with the Contract Specifications. The field tests shall be witnessed by the Engineer and certified by the Contractor.
- B. Motor testing shall be performed by the manufacturer's representative, prior to energizing equipment. Equipment shall not be energized without the permission of the Engineer. The testing shall be in accordance with the recommendations of the manufacturer's representative and shall include at a minimum the following:
 - 1. Motors shall be checked to determine that they have been properly installed, lubricated and connected.
 - 2. Motors shall be checked to determine they are not overloading, overheating or defective.
 - 3. Motors shall be checked to determine they comply with performance and design parameters.

3.3 MANUFACTURER'S FIELD SERVICES

- A. A qualified manufacturer's service representative shall assist in the installation of the motors, check the motor installation before it is placed into operation, assist in the performance of field tests, observe and assist initial operations and train the plant operations and maintenance staff in the care, operation and maintenance of the motors.
- B. The Contractor shall provide equipment start-up services and training.
- C. The Contractor shall provide a field report from the manufacturer's representative for each visit to the site. The report shall include complete information on time, schedule, tasks performed, persons contacted, problems corrected, tests results, training, instruction and all other pertinent information.
- D. The service representative shall sign in with the Engineer on each day they are at the site.

3.4 ACCEPTANCE TESTING

- A. The Contractor shall provide acceptance testing of the motors. All acceptance testing shall be performed by the testing firm, after the completion of the Field Tests specified under this Section. The acceptance testing shall be witnessed by the Engineer and certified by the Contractor.
- B. Acceptance testing inspection shall be performed on each motor larger than 200 horsepower. Inspection shall include the following:
 - 1. Electrical and grounding connections shall be inspected.
 - 2. Shaft alignment, proper mounting and lubrication shall be inspected.
 - 3. Ventilating air passageways shall be inspected for blockage.
 - 4. Excessive noise shall be inspected.
 - 5. Any overheating shall be inspected.
 - 6. Correct rotation shall be inspected.
 - 7. Protective detectors operation shall be checked.
 - 8. Any excessive vibration shall be checked.
 - 9. Space heater operation shall be checked.
- C. Acceptance electrical testing shall be performed on each motor larger than 200 horsepower. Testing shall include the following:
 - 1. Insulation resistance tests shall be performed.
 - 2. Surge comparison testing shall be performed.
 - 3. Vibration tests shall be performed.
 - 4. Bearing insulation resistant tests on insulated bearings shall be performed.
 - 5. Running current and voltage shall be measured and evaluated relative to load conditions and nameplate full-load amperes.
 - 6. High-potential tests shall be performed.
 - 7. For wound rotor motors, additional electrical testing at minimum and normal operating load points and at ring short shall be performed.
 - 8. Motors shall be operated with driven equipment for a minimum of 48 continuous hours and rechecked for overheating and vibration.
- D. All tests and values for AC and DC motors shall be in accordance with the manufacturer's recommendations and NETA ATS.
- E. The Contractor shall provide an acceptance testing report. The report shall be in accordance with NETA ATS.

-END OF SECTION-

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SECTION 26 41 13 LIGHTNING PROTECTION FOR STRUCTURES

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 lightning protection system for ordinary structures.
- B. Section includes lightning protection system for the following:
 - 1. Ordinary structures.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Include layouts of the lightning protection system, with details of the components to be used in the installation.
 - 2. Include raceway locations needed for the installation of conductors.
 - 3. Details of air terminals, ground rods, ground rings, conductor supports, splices, and terminations, including concealment requirements.
 - 4. Include roof attachment details, coordinated with roof installation.
 - 5. Calculations required by NFPA 780 for bonding of metal bodies.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Lightning protection system Shop Drawings, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Lightning protection cabling attachments to roofing systems and accessories.
 - 2. Lightning protection strike termination device attachment to roofing systems, coordinated with the roofing system manufacturer.
 - 3. Lightning protection system components penetrating roofing and moisture protection systems and system components, coordinated with the roofing system manufacturer.
- B. Qualification Data: For Installer.

- C. Product Certificates: For each type of roof adhesive for attaching the roof-mounted air terminal assemblies, approved by the roofing-material manufacturer.
- D. Field quality control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For lightning protection system to include in maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. A system testing and inspection record, listing the results of inspections and ground resistance tests, as recommended by NFPA 780, Annex D.
- B. Completion Certificate:
 - 1. UL96a LPI Master Certificate (Master Label).

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: UL-listed installer, category OWAY or LPI Master Installer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Harger or approved equal

2.2 PERFORMANCE REQUIREMENTS

- A. NFPA Lightning Protection Standard: Comply with NFPA 780 requirements for Class I buildings.
- B. UL Lightning Protection Standard: Comply with UL 96A requirements for Class I buildings.
- C. Lightning Protection Components, Devices, and Accessories: Listed and labeled by a qualified testing agency as complying with UL 96, and marked for intended location and application.

2.3 MATERIALS

- A. Air Terminals:
 - 1. Stainless steel unless otherwise indicated.
 - 2. 1/2-inch (12.7-mm) diameter by 18 inches (450 mm) long or as required.
 - 3. Rounded tip.

4. Threaded base support.
- B. Air Terminal Bracing:
 1. Stainless steel.
 2. 1/4-inch (6-mm) diameter rod.
- C. Class 1 Main Conductors:
 1. Stranded Copper: 57,400 circular mils in diameter.
- D. Secondary Conductors:
 1. Stranded Copper: 26,240 circular mils in diameter.
- E. Ground Loop Conductor: Stranded copper.
- F. Ground Rods:
 1. Material: Copper-clad steel, Stainless steel.
 2. Diameter: 3/4 inch (19 mm).
 3. Rods shall be not less than 120 inches (3050 mm) long.
- G. Conductor Splices and Connectors: Compression fittings that are installed with hydraulically operated tools, or exothermic welds, approved for use with the class type.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install lightning protection components and systems according to UL 96A.
- B. Install conductors with direct paths from air terminals to ground connections. Avoid bends less than 90 degrees and 8 inches (203 mm) in radius and narrow loops.
- C. Conceal conductors within normal view from exterior locations at grade within 200 feet (60 m) of building and as shown. Comply with requirements for concealed installations in UL 96A.
- D. Ground Ring Electrode: The conductor shall be not less than the main-size lightning conductor.

3.2 CONNECTIONS

- A. Aboveground concealed connections, and connections in earth or concrete, shall be done by exothermic welds or by high-compression fittings listed for the purpose.
- B. Aboveground exposed connections shall be done using the following types of connectors, listed and labeled for the purpose: bolted connectors.
- C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.

3.3 CORROSION PROTECTION

- A. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture unless moisture is permanently excluded from junction of such materials.
- B. Use conductors with protective coatings where conditions would cause deterioration or corrosion of conductors.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
 1. Perform inspections as required to obtain a UL Master Label for system.
 2. Perform inspections to obtain an LPI certification.
- B. Prepare test and inspection reports and certificates.

-END OF SECTION-

SECTION 26 51 00 – LIGHTING SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Lighting fixtures and devices shall be provided in accordance with the requirements specified under this section and the Contract Drawings.
2. The lighting system shall be complete and include all luminaires, devices and accessories as required for the installation of the lighting fixtures and devices.
3. The lighting control system specified in this section shall provide time-based, sensor-based (occupancy sensor), and manual lighting control.
4. The system shall be capable of turning lighting loads on/off as well as dimming lights (if lighting load is capable of being dimmed)
5. All system devices shall be networked together within spaces enabling digital communication and shall be individually addressable.
6. The system architecture shall be capable of enabling stand-alone groups (rooms) of devices to function in some default capacity even if network connectivity to the greater system is lost.
7. The system shall not require any centrally hardwired switching equipment.
8. Upgrade system software and components to the latest available products.
9. Furnish all labor, materials, equipment and incidentals required and install a complete lighting system ready for operation as shown on the Drawings and as specified herein

B. Related Sections:

1. Section 26 05 21 - Labeling and Identification
2. Section 26 05 33 - Electrical Raceway Systems

1.2 SCOPE OF WORK

- A. Furnish and install Acuity Brands nLight Network Lighting Controls system or approved equal in spaces as summarized in the Scope Overview and other contract documents. Includes providing and installing all necessary hardware devices, data cabling, and software to expand system as specified and full commissioning of network system.
- B. The Services included in this contract and to be provided by Acuity technicians include, but are not limited to, mapping services and commissioning.

1.3 SUBMITTALS

- A. Contractor shall submit working drawings, shop drawings and material specifications for the approval of the Engineer in accordance with the requirements of the General Conditions, Article 4 – Contractor’s Working Drawings, Design and Shop Drawings; and as specified under Division 1 of the Specifications.
- B. Working Drawings:
1. Prior to equipment submission, submit a list of proposed manufacturers with the products they produce proposed for the contract.
 2. Manufacturer’s catalog cuts technical information, and construction details for lighting fixtures and devices.
 3. Photometric data, developed for each fixture type.
 4. Lamp type and technical information.
 5. LED type and technical information.
 6. Scaled working drawings showing the locations of all fixtures and devices. The Drawings shall include the proposed routing of the branch circuits.
 7. Product Certificates: Submit certification from manufacturer indicating the expected useful life of the provided luminaires. The useful life shall be directly correlated to the IESNA LM-80 test data, interpreted per IESNA Tm-21. Minimum LED life shall be 50,000 hours.
 8. Submit manufacturers certification that fixture meets recyclability requirements.
- C. Alternative Fixture Submission:
1. It is understood that it is the right of the contractor to provide and install a different lighting fixture other than as specified on the Drawings (Competitive bid). Contractor is advised that selected fixture must be submitted to and approved by the engineer. For “or-equal” specified fixtures contractor must submit the following additional information with the lighting fixture submittal
 - a. Contractor shall submit the name, address, and telephone numbers of at least 5 comparable installations that can prove the proposed products have performed satisfactorily for 3 years. Certify in writing that the owners of the 5 comparable installations will allow inspection of their installations.
 - b. Provide written certification from the manufacturer that the proposed products are compatible for use with all other equipment proposed for use for this system and meet all contract requirements
 - c. Photometric Data – to be submitted by the Lighting Fixtures Supplier
 - 1) Submit complete photometric data for the fixture, including optical performance rendered by independent testing laboratory developed according to methods of the Illuminating Engineering Society of North America (I.E.S.) as follows:
 - a) For Down and Semi-Down Lights Used for General Illumination
 - (1) Table of coefficients of utilization for room cavity ratios of 1, 2, 3... to 10
 - (2) Ceiling reflectances of 80, 70, 50 and 0 and wall reflectances of 70, 50, 30 and 10.
 - (3) Visual comfort probability data (fluorescent only for 100 foot-candles), rooms with reflectances of

80% (ceiling), 50% (walls), and 20% (floor), including a 20 ft. x 20 ft. room with 10 ft. ceiling and luminaires lengthwise.

- (4) Candlepower data, presented graphically and numerically, in 5 deg. increments (5 deg., 10 deg., 15 deg., etc.) for vertical planes. Data developed for up and down hemispheres in a singular azimuthal plane for fixtures with axially symmetric distributions and in 22-1/2 deg. increments for as many quadrants as required to completely describe fixtures with quadrilaterally symmetric, bilaterally symmetric and asymmetric distributions.
- (5) Zonal lumens stated numerically in 10 deg. increments (5 deg., 15 deg., etc.).
- (6) Luminance summary table, calculated from the candlepower data, giving the luminance of the lighting fixture at altitudes of 0, 45, 55, 65, 75 and 85 degrees from nadir for each measured azimuth plane as described in paragraph 1.02.D.1.d.1.a.4 of this specification. The luminances should be stated in SI units (candelas/square meter).

b) A drawing of the site (in CAD format) with proposed lighting fixture locations, and lighting calculations super imposed on drawing plans-views, including foot-candle levels for the entire room. A minimum 2'x2' grid shall be used for the lighting calculations. All lighting calculations must be performed utilizing industry recognized software such as Visual Professional. Lighting calculations must meet or exceed the minimum lighting performance requirements shown under section 26 51 00.1.3.A

2. Submitted lighting fixture must be the same light source as the designed fixture (i.e. LED, Fluorescent, etc.)

D. Reports:

1. Field test reports shall be submitted.
2. Manufacturer's site visit report shall be submitted.

1.4 REFERENCES

A. Lighting fixtures and devices shall comply with the latest applicable provisions and recommendations of the following:

1. NEC- National Electrical Code
2. NFPA 70 - National Electric Code.
3. UL Standard No. 20 - General Use Snap Switches.
4. UL Standard No. 924 - Emergency Lighting and Power Equipment.
5. American National Standard Institute, ANSI.
6. ANSI C78.377-2008 - Specification on Chromaticity of Solid State Lighting Products for Electric Lamps.

CONTRACT No. 22-523
DIVISION 26 - ELECTRICAL

7. IESNA Standard LM-80-08 - Measuring Lumen Maintenance of LED Light Sources.
8. IESNA Standard TM-21-11 - Projecting Long Term Lumen Maintenance of LED Light Sources.
9. IEC 60529-2004 - Degrees of Protection Provided by Enclosures (IP Code).
10. IEC 60068-2-30 - Environmental Testing-Part 2-30: Tests Db: Damp heat, cyclic (12h + 12h cycle).
11. IEC 60068-2-14 - Environmental Testing. Tests: Test N. Change of temperature.

1.5 QUALITY ASSURANCE

A. General:

1. Lighting fixtures shall be UL listed and approved for use in Westchester County New York. The lighting fixture types are noted within the fixture schedule. The descriptions and catalog numbers serve to establish the quality, appearance and performance of the specified lighting fixtures.
2. All lighting fixtures shall be the products of lighting equipment manufacturers who have previously demonstrated, by performance and reputation, the ability to manufacture products of the quality specified. Such manufacturers must maintain an organization and manufacturing facility capable of actually manufacturing the specified lighting fixtures. For the purpose of inspection, Contractor shall assure the Engineer, free and easy access to the manufacturing facilities and inventories of any manufacturer whose equipment the Contractor proposes to supply.
3. The Contractor shall be responsible to assure that the exact inscription for exit and stairway signs required by local code is checked against that specified, prior to providing same. The Engineer shall be advised of any changes required to conform to local codes before such changes are effected.
4. The Contractor shall be responsible for reviewing all drawings of each Contract and coordinating with all trades the installation of lighting fixtures and devices. The lighting fixture and device finishes and construction shall be compatible with the wall and ceiling types based upon the Contractor's review of all drawings of each Contract.
5. All industrial fixtures shall be of the highest quality material and construction for their respective types.
6. Lamps for all lighting fixtures shall be in accordance with the Federal Energy Legislation for reduced energy consumption.
7. Fixtures shall be suitable for connection to concealed or exposed conduit runs as required in each particular location and shall be of sizes suitable for lamp sizes indicated on the Contract Drawings.
8. Fittings and other materials for special fixtures not definitely shown or specified shall be of approved material, make and quality and shall have a finish that will harmonize with other parts of the fixtures. Where suitable standard materials are not available such parts of the fixtures shall be specially manufactured.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Lighting fixtures and devices shall be delivered, stored and handled in accordance with the manufacturer's instructions.

1.7 WARRANTY

- A. The Contractor shall provide a written five-year on-site replacement warranty for all luminaires installed under this contract. Warranty shall include:
 - 1. Finish warranty against failure or substantial deterioration such as blistering, cracking, peeling, chalking, or fading.
 - 2. Defective or non-starting power supply units and LED source assemblies, which include, but not limited to, LED packages, LED arrays, LED modules, LED dies, Encapsulates, and phosphors.
 - 3. Replacement for any LED Source assembly, package, array, or module, which does not include the power supply, against 10% or more of the individual LEDs in that assembly, package, array, or module failing to illuminate.
- B. The warranty period shall begin on the date of final building acceptance on a per building basis.
- C. Field Testing:
 - 1. The lighting fixtures shall be field tested. The field testing shall be performed in accordance with the requirements specified under Article 3.03.

1.8 SPARE PARTS

- A. The Contractor shall furnish and deliver to the Engineer, at that part of the site and at such time as the Engineer may direct, spare lighting fixtures in accordance with the Detailed Specifications.
- B. The lighting fixtures shall be listed in an index and packed in containers suitable for long term storage, bearing labels clearly designating the manufacturer's part number with complete information for use and reordering.
- C. Furnish one (1) complete lighting fixture for each type installed. Fixtures shall be delivered in sealed original package and delivered to the school.
- D. Provide one (1) spare LED driver and one (1) spare LED module for each LED fixture type furnished.
- E. Provide an additional ten (10) percent of LED lamps for each lumen output furnished and installed within the contact, with a minimum of one (1) LED lamp per output lumen.
- F. Provide an additional ten (10) percent of occupancy sensors furnished and installed within the contact, with a minimum of one (1) sensor.
- G. Provide an additional ten (10) percent of Power relay packs furnished and installed within the contact, with a minimum of one (1) power relay pack.
- H. Provide an additional ten (10) percent of lighting switches furnished and installed within the contact, with a minimum of one (1) lighting switch for each switch specified

PART 2 - PRODUCTS

2.1 LIGHT FIXTURES

- A. Provide light fixtures complete with color LED light source and power supply units. Details, Shapes, and dimensions are indicative of general type desired but not intended to restrict selection to light fixtures of a particular manufacturer. Luminaires of similar design, light distribution and brightness characteristics, and of equal finish and quality will be acceptable.
- B. Light fixtures shall be UL-Listed for wet locations and wiring cavities shall be field-accessible for service or repair needs.
- C. Light fixtures must be rated for operation in ambient temperatures ranging from -30° C to +40° C.
- D. Optical systems for light fixtures, including the driver, shall be sealed and rated for IP 66 as defined in IEC 60529.
- E. Light fixtures shall be fully assembled and electrically tested prior to shipment from the factory.
- F. Light fixtures shall be fully functional after testing for thermal shock according to IEC 60068-2-14 and be fully functional after testing.
- G. Light fixtures shall be tested according to IEC 60086-2-30, damp heat, steady state, for high humidity and high temperatures and be fully functional after testing.
- H. All lenses shall be UV-Resistant.
- I. At least 80% of the lighting fixture material by weight shall be recyclable at the manufacturer's stated end of life.
- J. All lighting fixtures shall produce a minimum efficacy of 65 Lumens per Watt.
- K. Lighting fixtures shall incorporate modular electrical connections and be constructed to allow replacement of all or part optics, heat sinks power supply units, and electrical components using a simple tool, such as a screw driver.
- L. All fixtures shall bear a nameplate inscribed with the manufacturer's name, address, model number, date of manufacture, and serial number, securely affixed in a conspicuous place. The nameplate of the distributing agent will not be acceptable.
- M. A lighting fixture shall be provided for each fixture symbol shown on the Contract Drawings. Light fixtures shall be provided in accordance with the lighting fixture schedule shown in the Specifications.
- N. Light fixtures shall be provided with all necessary hangers, supports, conduit adaptors, reducers, hooks, brackets and other support hardware. All hardware shall have a protective, non-corrosive finish.
- O. Pendant fixtures shall be suspended by means of an enclosed and gasketed cushion type hanger. The hanger shall be suitable to be mounted directly to the fixture outlet box and shall provide a minimum of 8 degrees swing from the vertical. Fixture stems shall be threaded rigid metal conduit, 3/4 inch minimum size. In corrosive areas stems shall be PVC coated.
- P. Where fixtures are subjected to moisture, or assembled of dissimilar metals, gaskets of approved material and thickness shall be provided.

CONTRACT No. 22-523
DIVISION 26 - ELECTRICAL

- Q. Fixtures shall be completely wired except where they will be directly connected to branch circuit wiring. The conductors shall be not less than No. 12 gauge, stranded, with approved heat resistant covering.
- R. Mounting heights of all fixtures shall be as shown on the Contract Drawings. For special types, the height shall be determined at the time of installation.

2.2 LED TYPE EXIT SIGNS

- A. UL 924, NFPA 70, and NFPA 101. Exit signs shall be self-powered type .
- B. Provide unit with automatic power failure device, test switch, pilot light, and fully automatic high/low trickle charger in a self-contained power pack. Battery shall be sealed electrolyte type, shall operate unattended, and require no maintenance, including no additional water for a period of not less than 5 years. LED exit sign shall have 8" high lettering and an emergency run time of 90 minutes (minimum). The LEDs shall have a rated lamp life of 70,000 hours. Exit sign unit shall be approved to be used in Westchester County New York. Power consumption shall be 5 watts or less.

2.3 EMERGENCY LIGHTING EQUIPMENT

- A. UL 924, NFPA 70, and NFPA 101. Provide lamps in wattage as indicated. Unit shall be approved for use in Westchester County New York.
- B. Emergency lighting units shall be rated for 12 volts and be provided with two unit-mounted lamps.

2.4 LED POWER SUPPLY UNITS

- A. Minimum efficiency of 85%
- B. The maximum drive current to each individual LED shall not exceed 600 mA.
- C. Rated to operate between -30°C to 50°C with operating frequency of 50/60 Hz
- D. Designed to operate on voltage system 120V to 277V nominal. Fluctuations in line voltage up to 15% shall have no visible effect on the luminous output.
- E. Power factor (PF): ≥ 0.90 .
- F. Total current harmonic distortion (THD) for current: $\leq 20\%$.
- G. Comply with FCC 47 CFR Section 15, Class B, non-consumer RFI/EMI standards.
- H. Reduction of hazardous substances- (RoHS) compliant.
- I. Driver shall be protected against damage due to either an open-circuit or short-circuit fault condition on the driver output. The driver shall resume normal operation when the fault is cleared.
- J. Over-temperature protection shall be provided to cut off output power if temperature limit is exceeded. The driver shall resume normal operation when within normal operating temperature.

2.5 LED LIGHT SOURCE

- A. Correlated color temperature (CCT) shall be in accordance with ANSI C78.377; nominal 4000K: $3985 \pm 275K$.
- B. Color Rendering Index (CRI) shall be ≥ 80 for all CCTs.
- C. Thermal management shall be passive by design and shall consist of heat sinks with no fans, pumps, or liquids.

2.6 LED LAMPS

- A. LED Lamps shall adhere to the requirements defined within all sections of this specification and the following,
 - 1. LED lamps shall have a color temperature of 4000 degrees K, a CRI of 80 minimum, and a lumen maintenance L70 rating of 50,000 hours minimum.
 - 2. LED lamps shall be capable of 0-10V dimming.
 - 3. LED Lamp lumens are specified on Contract Drawing
 - 4. LED Lamp socket type shall be coordinated with final fixture selection.
 - 5. All lamps furnished outdoors shall be rated for outdoor use.
 - 6. Lamps shall have been tested utilizing IES LM-79-08 guidelines, Approved method: electrical and photometric measurements of solid state lighting products.

2.7 ELECTRICAL SYSTEM

- A. Surge Protection as provided by the manufacturer.

2.8 SYSTEM REQUIREMENTS

- A. System shall have an architecture that is based upon three main concepts; 1) intelligent lighting control devices 2) standalone lighting control zones.
- B. Intelligent lighting control devices shall consist of one or more basic lighting control components; occupancy sensors, photocell sensors, relays, dimming outputs, manual switch stations, and manual dimming stations. Combining one or more of these components into a single device enclosure should be permissible so as to minimize overall device count of system.
- C. System must interface with specified luminaires. See fixture Schedule & Construction Notes.
- D. Intelligent lighting control devices shall communicate digitally, require <4 mA of current to function (Graphic wall stations excluded), and possess RJ-45 style connectors.
- E. Lighting control zones shall consist of one or more intelligent lighting control components, be capable of stand-alone operation, and be capable of being connected to a higher level network backbone.
- F. Devices within a lighting control zone shall be connected with CAT-5e low voltage cabling in any order.

- G. Lighting control zone shall be capable of automatically configuring itself for default operation without any start-up labor required.
- H. Individual lighting zones must continue to provide a user defined default level of lighting control in the event of a system communication failure with the backbone network or the management software becoming unavailable.
- I. Power for devices within a lighting control zone shall come from either resident devices already present for switching (relay device) or dimming purposes, or from the network backbone. Standalone “bus power supplies” shall not be required in all cases.
- J. Individual lighting zones shall be capable of being segmented into several “local” channels of occupancy, photocell, and switch functionality for more advanced configurations and sequences of operation.
- K. System shall be capable of operating a lighting control zone according to scene controls. System shall be able to change a spaces scene based on user selection. Note scene selection modes should be utilized only in manners consistent with local energy codes.

2.9 NETWORKED LIGHTING RELAY CONTACTOR PANELS

- A. Lighting contactor panels shall be provided for the control of lighting fixtures where specifically indicated on the Contract Drawings. The panel control and devices shall be arranged for proper operation in accordance with the control schematics shown on the Contract Drawings.
- B. The panel enclosures shall be steel, single door type. Enclosures shall be NEMA 12 for dry, indoor areas and NEMA 4X Type 316 stainless steel for wet or outdoor areas or as shown on the Contract Drawings. Each enclosure shall be equipped with a control fuse with mounting block and 300 volt screw type terminal blocks.
- C. Contactors shall be of the electrically held type, suitable for 120 volt operation and switching ballast type lighting. Contactor voltage, ampere, number of poles and quantities within each panel shall be as shown on the Contract Drawings.
- D. Where indicated on the Contract Drawings, the lighting contactor panels shall be provided with selector switches and control relays. Selector switches and control relays shall be heavy duty industrial type.
- E. Network relay panels shall be able to communicate over the network utilizing manufacturer’s recommended communication protocol.
- F. Network relay panels shall be able to communicate to a minimum 128 digital devices per zone.
- G. Network relays panels shall be equipped with a minimum eight (8) programmable relays. All Relays shall include local manual over-rides. All relays must be capable of being individually programmed. Relays must be able to communicate with external sensors.
- H. Network panels and associated relays shall be single pole and rated for 120 VAC.
- I. Network panels shall have two RJ-45 ports.
- J. Network relays panel shall be equipped with a minimum one (1) sensor input. And shall be programmable to preset/profile scene, photosensor signal, or time-clocked controlled.

- K. Network relay panels shall be equipped with a build-in time clock.
- L. Network relays shall be magnetic standard ballast rated for 20A at 120VAC unless noted otherwise in Contract Drawings.
- M. Network relays panels shall be equipped with a minimum one (1) voltage barrier.
- N. Network panels shall be, UL 916 – Standards for Energy Management Equipment , rated

2.10 NETWORKED SYSTEM OCCUPANCY SENSORS

- A. Occupancy sensors system shall sense the presence of human activity within the desired space and fully control the on/off function of the lights.
- B. Sensors shall utilize passive infrared (PIR) technology, which detects occupant motion, to initially turn lights on from an off state; thus preventing false on conditions. Ultrasonic or Microphonic based sensing technologies shall not be accepted.
- C. For applications where a second method of sensing is necessary to adequately detect maintained occupancy (such as in rooms with obstructions), a sensor with an additional “dual” technology shall be used.
- D. Dual technology sensors shall have one of its two technologies not require motion to detect occupancy. Acceptable dual technology includes PIR/Microphonic (also known as Passive Dual Technology or PDT) which both looks for occupant motion and listens for sounds indicating occupants. Sensors where both technologies detect motion (PIR/Ultrasonic) shall not be acceptable.
- E. All sensing technologies shall be acoustically passive meaning they do not transmit sounds waves of any frequency (for example in the Ultrasonic range), as these technologies have the potential for interference with other electronic devices within the space (such as electronic white board readers). Acceptable detection technologies include Passive Infrared (PIR), and/or Microphonics technology. Ultrasonic or Microwave based sensing technologies shall not be accepted.
- F. Sensors shall be available with zero, one, or two integrated Class 1 switching relays, and up to one 0-10 VDC dimming output. Sensors shall be capable of switching 120 VAC. Load ratings shall be 800 W @ 120 VAC and ¼ HP motor. Relays shall be dry contacts.
- G. Sensors shall be available with one or two occupancy “poles”, each of which provides a programmable time delay.
- H. Sensors shall be available in multiple lens options which are customized for specific applications.
- I. Communication and Class 2 low voltage power shall be delivered to each device via standard CAT-6 low voltage cabling with RJ-45 connectors.
- J. All sensors shall have two RJ-45 ports or capable of utilizing a splitter.

- K. All sensors shall have the ability to detect when it is not receiving valid communication (via CAT-5 connections) and blink its LED in a pattern to visually indicate of a potential wiring issue
- L. Every sensor parameter shall be available and configurable remotely from the software and locally via the device push-button.
- M. Sensors shall be able to function together with other sensors in order to provide expanded coverage areas by simply daisy-chain wiring together the units with CAT-5 cabling.
- N. Sensors shall be equipped with an automatic override for 100 hour burn-in of lamps. This feature must be available at any time for lamp replacements.
- O. Wall switch sensors shall recess into single-gang switch box and fit a standard GFI opening.
- P. Wall switch sensors must meet NEC grounding requirements by providing a dedicated ground connection and grounding to mounting strap. Line and load wire connections shall be interchangeable. Sensor shall not allow current to pass to the load when sensor is in the unoccupied (Off) condition.
- Q. Wall switch sensors shall have optional features for photocell/daylight override, vandal resistant lens, and low temperature/high humidity operation.
- R. Wall switch sensors shall be available in four standard colors (Ivory, White, Light Almond, Gray)
- S. Wall switch sensors shall be available with optional raise/lower dimming adjustment controls
- T. Network system shall also have ceiling, fixture, recessed, & corner mounted sensors available.
- U. Sensors shall have optional features for photocell/daylight override, dimming control, and low temperature/high humidity operation.
- V. Sensors with dimming can control 0 to 10 VDC dimmable ballasts by sinking up to 20 mA of Class 2 current (typically 40 or more ballasts).

2.11 AUTOMATIC DIMMING CONTROL PHOTOCELL

- A. Photocell shall provide for an on/off set-point, and a deadband to prevent the artificial light from cycling. Delay shall be incorporated into the photocell to prevent rapid response to passing clouds.
- B. Photocell and dimming sensor's set-point and deadband shall be automatically calibrated through the sensor's microprocessor by initiating an "Automatic Set-point Programming" procedure. Min and max dim settings as well as set-point may be manually entered.

- C. Deadband setting shall be verified and modified by the sensor automatically every time the lights cycle to accommodate physical changes in the space (i.e., furniture layouts, lamp depreciation, or lamp outages).
- D. Sensors shall control 0 to 10 VDC dimmable ballasts by sinking up to 20 mA of class 2 current (typically 40 or more ballasts).
- E. Photocell and dimming sensors shall be equipped with an automatic override for 100 hour burn-in of lamps. This feature must be available at any time for lamp replacements. (Note: This function should be performed prior to any dimming of the lamps including the “auto set-point” setting.)
- F. Units shall have all features of on/off photocell and dimming sensors.
- G. A dual zone option shall be available for Automatic Dimming Control Photocell. The second zone shall be capable of being controlled as an “offset” from the primary zone.
- H. Line voltage versions of the above described photocell and combination photocell/dimming sensors shall be capable of switching both 120 VAC, 277 VAC, and 347 VAC. Load ratings shall be 800 W @ 120 VAC, 1200 W @ 277 VAC, 1500 W @ 347 VAC, and ¼ HP motor load. Relays shall be dry contacts.

2.12 NETWORKED SYSTEM POWER (RELAY) PACKS

- A. Power Pack shall incorporate one or more Class 1 relays and contribute low voltage power to the rest of the system. Secondary Packs shall incorporate the relay(s), shall have an optional 2nd relay, 0-10 VDC dimming output, or line voltage dimming output, but shall not be required to contribute system power. Power Supplies shall provide system power only, but are not required to switch line voltage circuit. Auxiliary Relay Packs shall switch low voltage circuits only.
- B. Power Packs shall accept 120 VAC and be plenum rated, and provide Class 2 power to the system.
- C. All devices shall have two RJ-45 ports.
- D. Every Power Pack parameter shall be available and configurable remotely from the software and locally via the device push-button.
- E. Power Pack shall securely mount to junction location through a threaded ½ inch chase nipple or be capable of being secured within a luminaire ballast channel. Plastic clips into junction box shall not be accepted. All Class 1 wiring shall pass through chase nipple into adjacent junction box without any exposure of wire leads. Note: UL Listing under Energy Management or Industrial Control Equipment automatically meets this requirement, whereas Appliance Control Listing does not meet this safety requirement.
- F. When required by local code, Power Pack must install inside standard electrical enclosure and provide UL recognized support to junction box. All Class 1 wiring is to pass through chase nipple into adjacent junction box without any exposure of wire leads.

- G. Power (Secondary) Packs shall be available that provide up to 16 Amp switching of all lighting load types.
- H. Power (Secondary) Packs shall be available that provide up to 5 Amps switching of all lighting load types as well as 0-10 VDC dimming or fluorescent ballasts/LED drivers.
- I. Specific Secondary Packs shall be available that provide up to 5 Amps of switching as well as 0-10 VDC dimming of fluorescent ballasts/LED drivers.
- J. Specific Secondary Packs shall be available that provide up to 5 Amps of switching and can dim 120 VAC incandescent lighting loads or 120/277 VAC line voltage dimmable fluorescent ballasts (2-wire and 3-wire versions).
- K. Specific Secondary Packs shall be available that provide up to 5 Amps of switching and can dim 120/277 VAC magnetic low voltage transformers.
- L. Specific Secondary Packs shall be available that provide up to 4 Amps of switching and can dim 120 VAC electronic low voltage transformers.
- M. Specific Secondary Packs shall be available that provide up to 5 Amps of switching of dual phase (208/240/480 VAC) lighting loads.
- N. Specific Secondary Packs shall be available that require a manual switch signal (via a networked Wall Station) in order to close its relay.
- O. Specific Power/Secondary Packs shall be available that are UL924 listed for switching of Emergency Power circuits.

2.13 NETWORKED SYSTEM WALL SWITCHES & DIMMERS

- A. Devices shall recess into single-gang switch box and fit a standard GFI opening.
- B. Devices shall be available with zero or one integrated Class 1 switching relay.
- C. Communication and low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
- D. All sensors shall have two RJ-45 ports.
- E. All devices shall provide toggle switch control. Dimming control and low temperature/high humidity operation are available options.
- F. Devices shall be available in four colors (Ivory, White, Light Almond, Gray).
- G. Devices with dimming control outputs can control 0-10 VDC dimmable ballasts by sinking up to 20 mA of current (typically 40 or more ballasts).
- H. Devices with capacitive touch buttons shall provide audible user feedback with different sounds for on/off, raise/lower, start-up, and communication offline.
- I. Devices with mechanical push-buttons shall provide tactile and LED user feedback.

- J. Devices with mechanical push-buttons shall be made available with custom button labeling
- K. Devices with a single on button shall be capable of selecting all possible lighting combinations for a bi-level lighting zone such that the user confusion as to which of two buttons (as is present in multi-button scenarios) controls which load is eliminated.

PART 3 - EXECUTION

3.1 INSTALLATION OF LUMINAIRES

- A. Luminaires shall be installed at locations shown on the Contract Drawings. Luminaires locations shall be adjusted where necessary to clear conflicts and obstructions.
- B. All luminaires shall be installed complete with all hardware, and supporting devices necessary to make a safe complete and fully operative installation. The Contractor shall obtain from the manufacturer for each lighting fixture, diagrams, illustrations and other installation instructions. The Contractor shall install in strict conformance with such instructions and the requirements of National Electrical Code.
- C. Pendant mounted fixtures shall be installed with conduit pendants of 3/4 inch.
- D. All pendant stem hangers shall be furnished with suitable aligner canopies or outlet box covers so that the lighting fixtures hang vertical to the finished floor irrespective of the angle of the surface from which they are suspended. When lighting fixtures or hanger canopies are mounted flush to the ceiling or wall, and where raceways and outlet boxes serving the lighting fixtures are surface mounted to the ceiling or wall, finishing rings shall be provided to conceal the outlet box. All visible hanging devices and appurtenances shall have the same finish as the lighting fixture.
- E. Reflectors, lenses, diffusers, louvers and decorative elements of lighting fixtures shall not be installed until completion of plastering, ceiling tile work, painting, and general clean-up in the area.

3.2 INSTALLATION OF DEVICES

- A. Lighting Control Panels:
 - 1. Panels shall be mounted rigidly and securely to the building structure or to supporting devices which are rigidly and securely supported to the building structure.
 - 2. Panels shall be fastened with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units and with machine screws or welded studs on metal.
 - 3. All panels shall be mounted parallel or perpendicular to walls, such that panels are installed in a neat and professional manner.

3.3 FIELD TESTS

- A. After installation, the completed lighting system and receptacle devices shall be field tested for operation and conformance. The field tests shall be witnessed by the Engineer and certified by the Contractor. The Contractor shall provide testing consisting of the following:

CONTRACT No. 22-523
DIVISION 26 - ELECTRICAL

1. Wiring continuity test shall be performed.
 2. Branch circuit load balance test shall be performed.
 3. Fixture and control operation test shall be performed.
 4. Emergency inverter system operation and functionality test shall be performed.
- B. The Contractor shall provide a field test report. The report shall identify the test performed and the results obtained.

3.4 DEMONSTRATION

- A. Training: Arrange for the services of a factory-authorized service representative to demonstrate programmable network lighting controls system and train Owner's personnel.
- B. Train Owner's personnel to operate, service, and maintain equipment and system components. Allow at least four (4) hours to conduct training. Schedule training with at least seven (7) days' notice to the Owner and Owner's Representative.

3.5 MANUFACTURER'S FIELD SERVICES

- A. A qualified manufacturer's service representative shall assist in the installation of the emergency inverter system, check the installation before it is placed into operation, assist in the performance of field tests, observe the initial operation and train the plant operations and maintenance staff in the care, operation and maintenance of the system.
- B. The Contractor shall provide equipment start-up services and training in accordance with the Specifications.
- C. The Contractor shall provide a field report from the manufacturer's representative for each visit to the site. The report shall include complete information on time, schedule, tasks performed, persons contacted, problems corrected, tests results, training instruction and all other pertinent information.
- D. The service representative shall sign in with the Engineer on each day they are at the site.

3.6 COMMISSIONING

- A. Operational Tests: Energize systems, program, control, and check each controlled area for light levels and lamp and component noise. Use light meters appropriate for the test and calibrated to NIST standards. Adjust components and revise installation as required to correct deficiencies. Operate the system to prove compliance with requirements.
- B. Upon completion of the installation, the network lighting controls system shall be completely commissioned by the manufacturer's factory-authorized technician who will verify all adjustments and ensure trouble-free operation of the system. This commissioning shall be performed once all walls are painted with final color, finished floor is in place, and finished ceilings are in place.
- C. Provide both the Owner and Owner's Representative with seven (7) days written notice of the scheduled commissioning date. Upon completion of the system fine tuning, the factory-authorized technician shall provide the proper training to the Owner's personnel in the adjustment and maintenance of the system and all its components.
- D. Correct malfunctions and re-test system until proper operation is achieved.

CONTRACT No. 22-523
DIVISION 26 - ELECTRICAL

3.7 CLEANING OF LUMINAIRES

- A. Luminaires shall be cleaned inside and out to remove construction dust prior to substantial completion.

-END OF SECTION-

SECTION 284621.11 - ADDRESSABLE FIRE-ALARM 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. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Heat detectors.
5. Notification appliances.
6. Device guards.
7. Addressable interface device.
8. Network communications.

1.3 DEFINITIONS

- A. EMT: Electrical Metallic Tubing.
- B. FACP: Fire Alarm Control Panel.
- C. HLI: High Level Interface.
- D. NICET: National Institute for Certification in Engineering Technologies.
- E. PC: Personal computer.
- F. VESDA: Very Early Smoke-Detection Apparatus.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product, including furnished options and accessories.
 1. Include construction details, material descriptions, dimensions, profiles, and finishes.
 2. Include rated capacities, operating characteristics, and electrical characteristics.
- B. Shop Drawings: For fire-alarm system.

1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
 2. Include plans, elevations, sections, details, and attachments to other work.
 3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
 4. Detail assembly and support requirements.
 5. Include voltage drop calculations for notification-appliance circuits.
 6. Include battery-size calculations for new and existing fire alarm panels with battery backup.
 7. Include input/output matrix.
 8. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
 9. Include performance parameters and installation details for each detector.
 10. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
 11. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale; coordinate location of duct smoke detectors and access to them.
 - a. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators.
 - b. Show field wiring required for HVAC unit shutdown on alarm.
 - c. Locate detectors according to manufacturer's written recommendations.
 12. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
- C. General Submittal Requirements:
1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
 2. Shop Drawings shall be prepared by persons with the following qualifications:
 - a. Trained and certified by manufacturer in fire-alarm system design.
 - b. Licensed or certified by authorities having jurisdiction.
- D. For notification appliances and smoke and heat detectors, in addition to submittals listed above, indicate compliance with performance requirements and design criteria, including analysis data signed and sealed by the qualified engineer responsible for their preparation.

1. Drawings showing the location of each notification appliance and smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the device.
2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72. Calculate spacing and intensities for strobe signals and sound-pressure levels for audible appliances.
3. Indicate audible appliances required to produce square wave signal per NFPA 72.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.
 1. Issue the following items and deliver copies to authorities having jurisdiction:
 - a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
 - c. Complete wiring diagrams showing connections between all devices and equipment. Each conductor shall be numbered at every junction point with indication of origination and termination points.
 - d. Riser diagram.
 - e. Device addresses.
 - f. Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:
 - 1) Equipment tested.
 - 2) Frequency of testing of installed components.
 - 3) Frequency of inspection of installed components.
 - 4) Requirements and recommendations related to results of maintenance.
 - 5) Manufacturer's user training manuals.
 - g. Manufacturer's required maintenance related to system warranty requirements.
 - h. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

- B. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL (nationally recognized testing laboratory).

1.7 PROJECT CONDITIONS

- A. Perform a full test of the existing system prior to starting work. Document any equipment or components not functioning as designed.
- B. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to occupied facilities unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:
 - 1. Notify Construction Manager and Owner no fewer than seven days in advance of proposed interruption of fire-alarm service.
 - 2. Do not proceed with interruption of fire-alarm service without Owner's written permission.
- C. Use of Devices during Construction: Protect devices during construction unless devices are placed in service to protect the facility during construction.

1.8 SEQUENCING AND SCHEDULING

- A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service, and label existing fire-alarm equipment "NOT IN SERVICE" until removed from the building.
- B. Equipment Removal: After acceptance of new fire-alarm system, remove existing disconnected fire-alarm equipment and wiring.

1.9 WARRANTY

- A. When warranties are required, verify with Owner's counsel that warranties stated in this article are not less than remedies available to Owner under prevailing local laws.
- B. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.
 - 1. Verify available warranties and warranty periods for units and components.
 - 2. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
 - 3. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Source Limitations for Fire-Alarm System and Components: Components shall be compatible with, and operate as an extension of, existing system. Provide system manufacturer's certification that all components provided have been tested as, and will operate as, a system.

- B. Noncoded, UL-certified addressable system, with multiplexed signal transmission and horn/strobe evacuation.
- C. All components provided shall be listed for use with the selected system.
- D. 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.

2.2 MANUAL FIRE-ALARM BOXES

- A. Fire-alarm boxes shall be manufactured by Edwards, unless approved otherwise. Devices by alternate manufacturers must be confirmed to be compatible with existing Edwards EST system.
- B. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
 - 1. Single-action mechanism, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
 - 2. Station Reset: Key- or wrench-operated switch.
 - 3. Indoor Protective Shield: Factory-fabricated, clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.
 - 4. Weatherproof Protective Shield: Factory-fabricated, clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.

2.3 SYSTEM SMOKE DETECTORS

- A. Smoke detectors shall be manufactured by Edwards, unless approved otherwise. Devices by alternate manufacturers must be confirmed to be compatible with existing Edwards EST system.
- B. General Requirements for System Smoke Detectors:
 - 1. Comply with UL 268; operating at 24-V dc, nominal.
 - 2. Detectors shall be two-wire type.
 - 3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
 - 4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to 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 digital-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.
 - a. Multiple levels of detection sensitivity for each sensor.
 - b. Sensitivity levels based on time of day.
- C. Photoelectric Smoke Detectors:
 1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
 2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status.
 - b. Device type.
 - c. Present average value.
 - d. Present sensitivity selected.
 - e. Sensor range (normal, dirty, etc.).
- D. Duct Smoke Detectors: Photoelectric type complying with UL 268A.
 1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
 2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status.
 - b. Device type.
 - c. Present average value.
 - d. Present sensitivity selected.
 - e. Sensor range (normal, dirty, etc.).
 3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector for smoke detection in HVAC system ducts.
 4. Each sensor shall have multiple levels of detection sensitivity.
 5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
 6. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.

2.4 CARBON MONOXIDE DETECTORS

- A. Carbon monoxide detectors shall be manufactured by Edwards, unless approved otherwise. Devices by alternate manufacturers must be confirmed to be compatible with existing Edwards EST system.
- B. General: Carbon monoxide detector listed for connection to fire-alarm system.
 - 1. Mounting: Adapter plate for outlet box mounting.
 - 2. Testable by introducing test carbon monoxide into the sensing cell.
 - 3. Detector shall provide alarm contacts and trouble contacts.
 - 4. Detector shall send trouble alarm when nearing end-of-life, power supply problems, or internal faults.
 - 5. Comply with UL 2075.
 - 6. Locate, mount, and wire according to manufacturer's written instructions.
 - 7. Provide means for addressable connection to fire-alarm system.
 - 8. Test button simulates an alarm condition.

2.5 HEAT DETECTORS

- A. Heat detectors shall be manufactured by Edwards, unless approved otherwise. Devices by alternate manufacturers must be confirmed to be compatible with existing Edwards EST system.
- B. General Requirements for Heat Detectors: Comply with UL 521.
 - 1. Temperature sensors shall test for and communicate the sensitivity range of the device.
- C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 135 deg F.
 - 1. Mounting: Adapter plate for outlet box mounting.
 - 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.6 NOTIFICATION APPLIANCES

- A. Notification devices shall be manufactured by Edwards, unless approved otherwise. Devices by alternate manufacturers must be confirmed to be compatible with existing Edwards EST system.
- B. General Requirements for Notification Appliances: Individually addressed, connected to a signaling-line circuit, 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, equipped for mounting as indicated, and with screw terminals for system connections.

- C. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.
- D. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- high letters on the lens.
 - 1. Rated Light Output:
 - a. 15/30/75/110 cd, selectable in the field.
 - 2. Mounting: Wall mounted unless otherwise indicated.
 - 3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
 - 4. Flashing shall be in a temporal pattern, synchronized with other units.
 - 5. Strobe Leads: Factory connected to screw terminals.
 - 6. Mounting Faceplate: Factory finished, red.

2.7 ADDRESSABLE INTERFACE DEVICE

- A. Interface devices shall be manufactured by Edwards, unless approved otherwise. Devices by alternate manufacturers must be confirmed to be compatible with existing Edwards EST system.
- B. General:
 - 1. Include address-setting means on the module.
 - 2. Store an internal identifying code for control panel use to identify the module type.
 - 3. Listed for controlling HVAC fan motor controllers.
- C. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.
- D. Integral Relay: Capable of providing a direct signal to circuit-breaker shunt trip for power shutdown.
 - 1. Allow the control panel to switch the relay contacts on command.
 - 2. Have a minimum of two normally open and two normally closed contacts available for field wiring.
- E. Control Module:
 - 1. Operate notification devices.
 - 2. Operate solenoids for use in sprinkler service.

2.8 DEVICE GUARDS

- 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 device manufacturer.
 - 2. Finish: Paint of color to match the protected device.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.
 - 1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed before installation begins.
- B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760 "Fire Alarm Systems."
 - 1. Devices placed in service before all other trades have completed cleanup shall be replaced.
 - 2. Devices installed but not yet placed in service shall be protected from construction dust, debris, dirt, moisture, and damage according to manufacturer's written storage instructions.
- B. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.
 - 1. Connect new equipment to existing control panel in existing part of the building.
 - 2. Connect new equipment to existing monitoring equipment at the supervising station.
 - 3. Expand, modify, and supplement existing control equipment as necessary to extend existing control functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.
- C. Install wall-mounted equipment, with tops of cabinets not more than 78 inches above the finished floor.
- D. Manual Fire-Alarm Boxes:
 - 1. Install manual fire-alarm box in the normal path of egress within 60 inches of the exit doorway.

2. Mount manual fire-alarm box on a background of a contrasting color.
 3. The operable part of manual fire-alarm box shall be between 42 inches and 48 inches above floor level. All devices shall be mounted at the same height unless otherwise indicated.
- E. Smoke- or Heat-Detector Spacing:
1. Comply with the "Smoke-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
 2. Comply with the "Heat-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for heat-detector spacing.
 3. Smooth ceiling spacing shall not exceed 30 feet.
 4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Annex A in NFPA 72.
 5. HVAC: Locate detectors not closer than 36 inches from air-supply diffuser or return-air opening.
 6. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture and not directly above pendant mounted or indirect lighting.
- F. Install a cover on each smoke detector that is not placed in service during construction. Cover shall remain in place except during system testing. Remove cover prior to system turnover.
- G. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Tubes more than 36 inches long shall be supported at both ends.
1. Do not install smoke detector in duct smoke-detector housing during construction. Install detector only during system testing and prior to system turnover.
- H. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.
- I. Audible/Visible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install combination horn/strobes on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.
- J. Device Location-Indicating Lights: Locate in public space near the device they monitor.
- 3.3 PATHWAYS
- A. Pathways above recessed ceilings and in non-accessible locations may be routed exposed.
1. Exposed pathways located less than 96 inches above the floor shall be installed in EMT.
- B. Exposed EMT shall be painted red enamel.

3.4 CONNECTIONS

- A. Coordinate installations and specialty arrangements with Drawings and with requirements specified in related Sections. If Drawings are explicit enough, these requirements may be reduced or omitted.
- B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 36 inches from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
 - 1. Coordinate list below with "Systems Operational Description" Article.
 - 2. Alarm-initiating connection to smoke-control system (smoke management) at firefighters' smoke-control system panel.
 - 3. Alarm-initiating connection to stairwell and elevator-shaft pressurization systems.
 - 4. Smoke dampers in air ducts of designated HVAC duct systems.
 - 5. Supervisory connections at valve supervisory switches.
 - 6. Data communication circuits for connection to building management system.
 - 7. Supervisory connections at fire-extinguisher locations.

3.5 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals.
- B. Install framed instructions in a location visible from fire-alarm control unit.

3.6 GROUNDING

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.
- B. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Visual Inspection: Conduct visual inspection prior to testing.
 - a. Inspection shall be based on completed record Drawings and system documentation that is required by the "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
 - b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
 3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
 4. Test visible appliances for the public operating mode according to manufacturer's written instructions.
 5. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
- C. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- D. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.
- F. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.
- G. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.8 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include preventive maintenance, repair, or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
1. Include visual inspections according to the "Visual Inspection Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
 2. Perform tests in the "Test Methods" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
 3. Perform tests per the "Testing Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

3.9 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION

SECTION 31 00 00 - EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. All grading, excavation and backfill.
 - 2. Pipe bedding
 - 3. Classification of materials
 - 4. Disposal of excess and unsuitable material
 - 5. Importing of classified fill material to construct project structures including buildings, pipelines, roadways, etc.
 - 6. Placement of fills
 - 7. Grading

- B. Related Sections
 - 1. Section 31 23 19 – Dewatering
 - 2. Section 31 23 24 – Compaction

1.3 REFERENCES

- A. General Requirements:
 - 1. Except as modified by governing codes and by this Specification, comply with the applicable provisions and recommendations of latest editions of the below listed references.
 - 2. Where the language in any of the documents referred to herein is in the form of a recommendation or suggestion, such recommendations or suggestions shall be deemed to be mandatory under this Contract unless otherwise directed by the Engineer.
 - 3. Conflicts: Conform to requirements of cited standard unless specified otherwise. In case of apparent conflict between standards, or between standards and the specifications herein, the more stringent shall apply unless otherwise directed by the Engineer.

- B. Occupational Safety and Health Administration (OSHA).

- C. New York State Department of Labor, Rule. No. 23 of the Industrial Code – “Protection in Construction, Demolition and Excavation Operations”

- D. New York State Department of Transportation
 - 1. The New York State Department of Transportation Standard Specifications (NYS-DOT Specifications) for Construction and Materials, Latest Revision, plus addenda when referred to, shall become part of this specification for materials and construction requirements. A referenced New York State (NYS) Pay Item Number shall serve the required work for this project providing materials and construction

conforming to all applicable requirements under the NYS-DOT specifications for that New York State Item, except for measurement and payment. The measurement and payment section of the NYS-DOT Specification shall not apply as all work under this Section shall be included in the Contractor's lump sum bid for this Contract. Where the New York State DOT Specifications cite requirements differing from those included or specified elsewhere in these Contract Documents, the more stringent, highest quality requirement shall apply.

- E. ASTM International:
 - 1. ASTM D422 - Standard Test Method for Particle-Size Analysis of Soils
 - 2. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³))
 - 3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))
 - 4. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- F. All other applicable Federal, State and Municipal codes, rules and regulations

1.4 DEFINITIONS

- A. Backfill - Soil material or controlled low-strength material used to fill an excavation.
 - 1. Pipe Foundation - Backfill placed below, beside, and over pipe in a trench, including haunches to support sides of pipe.
 - 2. Final Backfill - Backfill placed over pipe foundation to fill a trench.
 - 3. Backfill Under Structures – Backfill placed under structures.
 - 4. Backfill Next to Structures – Backfill placed adjacent to and against structures.
- B. Base Course - Course placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course - Course placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil - Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course - Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation - Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
- G. Fill - Soil materials used to raise existing grades.
- H. Hard/Unyielding Materials – Materials comprised of weathered rock, dense consolidated deposits, or conglomerate materials which are not included in the definition of “rock”

with stones greater than six (6) inches in any dimension. These materials typically require the use of heavy excavation equipment, ripper teeth, or jack hammers for removal.

- I. Rock
 - 1. Solid homogeneous interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe-mounted pneumatic hole punchers or rock breakers.
 - 2. Large boulders, buried masonry, or concrete other than pavement exceeding ½ cubic yard in volume.
- J. Structures - Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- K. Subbase Course - Course placed between the subgrade and base course for hot-mix asphalt pavement, or course placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk, or course placed between the subgrade and slab-on-grade.
- L. Subgrade - Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- M. Utilities - On-site underground pipes, conduits, ducts, and cables

1.5 SUBMITTALS

- A. Excavation Plan including the following as a minimum:
 - 1. Limits of excavation
 - 2. Excavation Protection Systems
 - 3. Sequence and schedule of excavation, backfill, fill and grading.
 - 4. Material stockpile locations
 - 5. Equipment including operating characteristics
 - 6. Dust and noise mitigation
- B. On-Site Materials: At the direction of the Engineer, the following tests shall be conducted on samples of onsite excavated material proposed to be used as fill or backfill and submitted to the Engineer for review
 - 1. Gradation and maximum density determined in accordance with the requirements of ASTM D422, ASTM D698 and ASTM D1557
 - 2. Atterberg Limits determined in accordance with ASTM D4318.
- C. Borrow Material
 - 1. Samples in airtight containers of each aggregate material from each material source proposed for use as fill shall be submitted to the Contractor's independent

testing laboratory to ascertain its quality and gradation of particle size. Certified test results shall be submitted to the Engineer for review. The material shall not be used as a fill until approved by the Engineer.

2. Gradation and certification of aggregate material for each material source to be used as fill shall be submitted to the Engineer ten (10) working days prior to commencing filling operations. This material shall not be used as a fill until approved by the Engineer.
3. Submit name of each material supplier and specify type and source of material. For sources pre-approved by NSDOT, submit proof of NYSDOT certification.
4. The Engineer reserves the right to inspect proposed source of off-site granular material and to order such tests of the materials as he deems necessary to ascertain its quality and gradation of particle size. The Contractor shall, at his own expense, engage an approved testing laboratory to perform such test, and submit certified test results to the Engineer. If similar tests of the material from a particular source were performed previously, submit results of these tests to the Engineer for consideration.

- E. Product Data - For the following:
1. Each type of plastic warning tape.

1.6 SUBSURFACE INFORMATION

- A. Subsurface investigations have been performed at the site. The location of each exploration and the information obtained is shown on boring logs and is attached for the Contractor's information.
- B. Permission may be granted to the Contractor upon request, to drill borings or dig test pits for the purpose of verifying conditions at the site. The locations and size of such exploratory holes will be subject to approval by the Owner and the cost of such explorations shall be borne by the Contractor.
- C. The Contractor shall examine the site as well as all available information and then decide for himself the character of materials to be encountered. Attention is directed to the fact that subsurface conditions at other than the boring, probe and test pit locations may include different soils, hard or soft strata, obstructions that may be either natural or manmade, or other conditions different from those shown in the borings, probes and test pits. The boring logs make no representations or warranties either as to the presence or absence of such different conditions or as to their nature and extent.
- D. The groundwater levels shown in the borings and test pits were measured during or shortly after drilling. The groundwater may rise during wet weather or fall during dry weather. The Contractor is hereby advised that varying groundwater levels are to be expected and that this may affect any construction operations involving earthwork.

1.7 SITE CONDITIONS NOT GUARANTEED

- A. Neither the Engineer nor the Owner guarantees that materials disclosed by the borings, probes and test pits will actually be encountered. The data is supplied only for general information and is not guaranteed.
- B. The subsurface information referred to herein is made available to the Contractor in good faith and so that he may have access to the same information utilized for design and estimating purposes and is not intended as a substitute for personal investigation, interpretations and judgment of the Contractor.

1.8 QUALITY ASSURANCE

- A. Samples of backfill shall be tested for conformance with the requirements of this section
 1. Gradation and maximum density shall be determined.
- B. For setting and establishing final elevations and lines, the Contractor shall secure the services of a surveyor licensed in the State of New York acceptable to the Engineer.
 1. The cost of the surveyor shall be borne by the contractor
 2. Carefully preserve all data and monuments and data set by the surveyor
 3. If data or monuments are lost or displaced, the surveyor shall immediately replace the data or monuments.
 4. The cost of the surveyor shall be borne by the Contractor

1.9 FIELD MEASUREMENTS

- A. Verify that survey benchmark and intended elevations for the Work are as indicated.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

- A. If practicable, use materials removed from excavation as fill and backfill if those materials satisfy requirements specified herein, as determined by the Engineer. Approved onsite materials must meet the proper moisture content.
- B. All material excavated shall be classified as "Suitable Material" or "Unsuitable Material" as follows
 1. Suitable Material:
 - a. Suitable Material shall be defined as material whose composition is satisfactory for use in formation of fill section, subgrade, embankment, etc. construction.
 - b. In general, any mineral (inorganic) soil, blasted or broken rock, free of organic and deleterious materials, and particles with a diameter not greater than six (6) inches, shall be considered Suitable Material.
 - c. This material shall be further classified in accordance with Article 2.2 – "On-Site Materials" of this Section. At the request of the Engineer, the

- material shall be tested in accordance with the requirements of Article 1.8C – “Quality Assurance” of this Section.
- d. Suitable Material not immediately used in the work shall be stockpiled in a designated storage area.
 - e. All Suitable Materials shall remain the property of the Owner until such time as indicated by the Engineer.
 - f. Excess Suitable Material not used in the Work and not to be retained by the Owner shall be removed from the project site at no cost to the Owner.
2. Unsuitable Material:
 - a. Unsuitable Material shall be defined as any material containing vegetation or organic matter, such as muck, peat, organic silt, topsoil sod, deleterious material, and particles greater than six (6) inches in diameter, that is not satisfactory for use in embankment construction or for support of permanent structures.
 - b. Materials located below the groundwater table may not be used as fill.
 - c. Unsuitable Materials may be temporarily stored on the project site in designated waste or spoil areas.
 - d. All Unsuitable Materials shall be removed from the project site at no cost to the Owner.
 3. Classification of all material excavated will be made by the Engineer whose decision shall be final and binding upon the Contractor.
 4. Should the Contractor encounter unusual material he shall immediately notify the Engineer, who will examine the material, classify it and advise the Contractor as to the method of handling. Unauthorized removal of material before it has been classified is performed at the Contractor's risk.
- C. Provide borrow soil materials in accordance with the requirements of Article 2.3 of this Section when sufficient Suitable Materials are not available from excavations.

2.2 ON-SITE MATERIALS

- A. Type A, Excavated Material - Material under this classification shall be derived solely from excavations necessary to construct the project to the lines and grades specified. If the excavated material on-site is approved for reuse and is suitable, it shall be used for filling or backfilling purposes. If he so elects, the Contractor may, at his own expense, substitute other types of material in place of Type A material, provided such substitution is approved in advance by the Engineer. All replaced or surplus material shall be disposed of as directed by Owner.
1. Unclassified Excavated Material
 - Type A-1 - Referred to as “excavated material” and from which all frozen material, boulders, trash, foreign debris, and material greater than 6 inches in any dimension has been removed. Approved Type A-1 material shall be used for all backfilling as modified herein or on the Contract Drawings.
 - Type A-2 - Referred to as “select excavated material” and from which all frozen material, humus, peat, roots, vegetation, ashes, trash, debris, and rocks or stones greater than 2 inches in any dimension have been removed.

2. Classified Excavated Material - Where the Contract Documents allow the reuse of excavated on-site materials as a substitute for off-site sources, the minimum requirements for each of those excavated materials shall be the same as required for the equivalent off-site material. If such materials are used, submit for approval in writing the proposed methods of excavation, location of stockpiles, quantities of required sand and gravels, estimated excavation quantities and proposed excavation limits within the accepted excavation area. Provide a demonstration at least 10 days prior to commencement of excavation that the methods will provide consistent quantity and quality. The Engineer will require subsurface investigations, sampling, and testing to confirm the extent and quality of the proposed material. Cost of all investigations, sampling, and testing shall be the Contractor's responsibility.

2.3 OFF-SITE MATERIALS

- A. Within the following specifications where grain size distribution requires a maximum of 10 percent or less material capable of passing the #200 mesh sieve, the percentage of material finer (than the #200 sieve) by weight shall be determined by wet screening in accordance with ASTM Standard D-1140. It is the intent of the specifications to allow the use of granular materials from local suppliers. Material Specifications shall conform to the requirements of the New York State Department of Transportation, (NYSDOT) Standard Specifications, latest edition. No gravel, sand, crushed stone or run-of-crusher material shall be used for this project until acceptance is obtained from the Engineer, only material from approved sources shall be used. A certified sieve analysis from the supplier and the Contractor's independent testing laboratory shall be submitted for the Engineer's acceptance prior to the use of any materials specified in this Article 2.3.
- B. NYSDOT Subbase Course 304
 1. Shall be a mixture of hard, durable gravel, stone, and sand.
 2. Shall be free from organic matter, trash, shale, debris, snow ice and other frozen or mechanically deleterious material.
 3. Each type of gravel fill material shall also meet the gradation requirements NYSDOT Standard Specifications Table 304-1.
 4. Gravel Fill Materials
 - a. NYSDOT Subbase Course 304, Type 2
 - b. NYSDOT Subbase Course 304, Type 4
- C. NYSDOT 703-0201 Crushed Stone
 1. Shall be clean, hard, durable, angular crushed stone.
 2. Shall be free from organic matter, trash, debris, snow, ice and other frozen or mechanically deleterious material.
 3. Unless otherwise specified, crushed stone shall be composed of limestone pieces, chips and fines.
 4. All crushed stone shall also meet the gradation requirements of NYSDOT Standard Specifications Table 703-4.
 5. The material shall be obtained from sources which are approved by the NYSDOT, Material Designation 703-0201.

- D. Select Granular Material: Stockpiled, sound, durable, sand, gravel, stone, or blends of these materials, free from organic and other deleterious materials. Comply with the gradation and material requirements specified below:

Sieve Size	Percent Passing
2 inch	100
1/4 inch	30-65
No. 40	5-40
No. 200	0-10

1. Magnesium Sulfate Soundness Test: 20 percent maximum loss by weight after four test cycles.
2. Plasticity Index: The plasticity index of the material passing the No. 40 mesh sieve will not exceed 5.0.
2. Elongated Particles: Not more than 30 percent, by weight, of the particles retained on a 1/2 inch sieve will consist of flat or elongated particles. A flat or elongated particle is defined as one which has its greatest dimension more than three times its least dimension.

- E. Sand: Stockpiled clean fill material conforming to the sieve analysis specified below. The material shall have a pH value greater than 5.5 and shall be free of cinders, ashes, vegetable matter, rubbish or any foreign matter.

Sieve Size	Percent Passing
3/8 inch	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	10-30
No. 200	0-0

- F. Geotechnical Fabrics

1. Filter Fabric (Geotextile):
 - a. Type 1 - Drainage and Erosion Control: Amoco 1199 & 2019, Maccaferri MacTex MX140 & MX155, Mirafi 140N & 160N, Fiberweave 403 & 404 or approved equal.
 - b. Type 2 - Separation for foundation drains, underdrains, undercuts: Amoco 2002 & 2004, Contech Construction Products Inc. C-180, Synthetic Industries Geotex 250ST & 315ST, Mirafi Geolon HP570 & HP1500 or or approved equal.
 - c. Type 3 - Separation/Stabilization beneath pavements: Amoco 4551, Bonded Fibers Products PN080, Maccaferri Gabions MacTex MX275 & 340, Mirafi 160N & 180N or t.

2.4 REQUIRED MATERIALS

- A. Materials required for filling, backfilling, subbase and other purposes shall be as shown on the Drawings. Prior to bidding, prospective contractors shall familiarize themselves with the available quantities of approved on-site and off-site materials.
- B. Trench Backfill
1. Unless otherwise noted on the Contract Drawings, or specified elsewhere, trench backfill material shall conform to the following as specified in Section 31 23 23 – “Fill”
 - a. In Pavement, to Subbase – NYSDOT Subbase Course 304, Type 4
 - b. Other Areas - Type A-1
 2. Pipe Bedding
 - a. Gas Piping - Sand
 - b. Plastic Pining - Sand
 - c. All Other Piping - NYSDOT 703-0201 No. 1 Stone Bedding.
 3. Moderately Unstable Soil Replacement
 - a. NYSDOT 703-0201 No. 1 or No. 2 Stone Bedding as directed by the Engineer.
 - b. Type 2 Geotextile
 4. Unstable Soil Replacement
 - a. Top Layer - NYSDOT 703-0201 No. 2 Stone Bedding
 - b. Bottom Layer - NYSDOT 703-0201 No. 3 Stone Bedding
 - c. Type 2 Geotextile
 5. Road Construction Base Course – NYSDOT Subbase Course 304, Type 2
 6. Structure Backfill – NYSDOT Subbase Course 304, Type 2.

2.5 BURIED WARNING AND IDENTIFICATION TAPE

- A. Provide metallic core or metallic faced, acid and alkalai-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines.
- B. Tapes shall be provided on rolls.
- C. Tape width shall be 3-inch minimum.
- D. Tapes shall be color-coded as specified below for the intended utility warning and identification.
- E. Tape shall be imprinted in bold black letters continuously over the entire tape length. Warning and identification shall read “CAUTION, BURIED (utility as identified below) LINE BELOW” or similar wording.

WARNING TAPE COLOR CODES	
COLOR	UTILITY
Red	Electric
Yellow	Gas, Oil; Dangerous Materials
Orange	Telephone and Other Communications
Blue	Water Systems
Green	Sewer Systems
White	Steam Systems
Gray	Compressed Air

- F. Tape for Metallic Piping
1. Tape for metallic piping shall be acid and alkali-resistant polyethylene tape conforming to the width, color, and printing requirements specified above, with a minimum thickness of 0.003 inch and a minimum tensile strength of 1500 psi lengthwise and 1250 psi crosswise, with a maximum 350% elongation.
- G. Detectable Warning Tape for Non-Metallic Piping
1. Tape for non-metallic piping shall be polyethylene plastic tape conforming to the width, color, and printing requirements specified above, with a minimum thickness of 0.004 inch, and a minimum tensile strength of 1500 psi lengthwise and 1250 psi crosswise.
 2. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by metal detector when the tape is buried up to 3 feet deep.
 3. Metallic elements of the tape shall be encased in a protective jacket or provided with other means of corrosion protection.

PART 3 EXECUTION

3.1 GENERAL

- A. Removal of Water
1. At all times during construction of the work and until final acceptance, provide and maintain means and equipment of removing and properly disposing of water entering the excavation in accordance with the requirements of Section 31 23 19.
- B. Lines and Grades
1. General: Excavate for sewers, drains, conduits, pipe lines, walls, foundations, footings, and other structures, including any excavating indicated on the Contract Drawings or necessary, to the lines and grades shown on the Contract Drawings, specified or required.
 2. Demolition: Cut pavements, curbs and sidewalks with non-impact tools or other equipment approved by the Engineer. Breaking of pavements, curbs and sidewalks by impact, such as with the use of a ball, is not permitted. When removing sections next to sections that are to remain, sawcut the full depth of the concrete and asphalt.
 3. Adequate Space: Do all trimming, grading and other incidental work to the grades and slopes shown on the Contract Drawings, specified or required as approved by the Engineer. Perform all excavations of sufficient size for the

proper execution and inspection of the work. Keep excavation in good condition at all times and fill all voids which may endanger existing structures to the satisfaction of the Engineer

- C. Existing Underground Utilities
1. The Contractor is responsible for the movement of construction machinery and equipment over pipes and utilities during construction.
 2. Hand excavate within 3 feet of underground utilities. Excavation with power driven equipment within 3 feet of underground utilities is prohibited.
 3. Support uncovered utilities or other work affected by contract excavation.
 4. The Contractor shall immediately inform the Engineer of any breaks or damage to existing utilities immediately. In the event of any break or other damage, the Contractor shall be responsible to immediately repair the lines at his own cost, or arrange for the appropriate utility to make such repair at the Contractor's cost.
- D. Subgrade Consolidation
1. Generally, compact subgrade to density requirements for subsequent backfill materials.
 2. Cut out soft areas of subgrade not capable of in situ compaction. Backfill with NYSDOT subbase course 304 Type 2 fill and compact to density equal to or greater than requirements for subsequent backfill material, or replace with 2,500 psi concrete.
 3. Dispose of unsatisfactory excavated materials.
- E. Frost Prevention
1. Protection shall be provided against the penetration of frost into material below the bearing level during work in the winter months. This protection shall consist of a temporary blanket of straw or salt hay covered with a plastic membrane or other approved means.
- F. Segregation, Storage and Disposal of Materials
1. Segregating: All unsuitable material which may be excavated by the Contractor in his operations shall be kept separated from good excavated material and disposed of elsewhere at the Contractor's expense.
 2. Stockpiling: Excavated material to be used for backfilling shall be so piled and placed as not to encumber sidewalks or roadways, or wash away or obstruct the free flow of surface or drainage water. Excavated material shall not be placed closer to the edge of an excavation than a distance equal to 1-1/2 times the depth of the excavation, unless the excavation is in rock or the sides of the excavation have been sloped or sheeted and shored to withstand the lateral forces imposed by such superimposed loads.
 3. All stockpiles of excavated soil shall be covered with an impermeable, woven polyethylene fabric. The fabric shall be a composite structure of woven polyethylene fabric and 1.5 mils of polyethylene film laminated on both sides to form a monolithic sheet. The fabric shall be inert to biological degradation and naturally encountered chemicals, alkalis and acids. Its permeability coefficient shall be less than 10⁻³ cm/sec. The terminal edges of the fabric panels shall be

secured to prevent uplift by wind. Stockpiles shall be covered during non-working hours and during periods of no construction activity.

4. Excess Materials:
 - a. All excavated material except reusable topsoil or reusable fill shall be classified as surplus material and disposed of off-site unless Owner designates an on-site location.
 - b. On-site disposal of surplus material will not be allowed. Reuse of excavated material as on-site fill shall conform with Articles 2.1 and 2.2 of this Section.
 - c. The Contractor, at his own expense, shall make arrangements for and properly dispose of all surplus material unless the Engineer designates certain public areas where satisfactory material shall be deposited and spread. Excess excavated material shall not be disposed of on-site or in environmentally sensitive areas such as wetlands, stream corridors and flood plains, even with permission of the property owner.
 - d. Prior to depositing surplus material at any off-site location, obtain a written agreement between Contractor and the owner of the property on which the disposal of the material is proposed. The agreement shall state that the owner of the property gives permission for the Contractor to enter and deposit material of a particular classification on the owner's property at no expense to the project Owner, and shall include any other conditions pertinent to the situation as agreed upon by each party. A copy of said agreement shall be furnished to the Owner.

- G. Excavations shall be in complete accordance with all details of applicable codes, rules, and regulations including all local, state, and federal regulations including:
 1. Occupational Safety and Health Administration (OSHA) Title 29 Code of Federal Regulations Part 1926, Subpart P - Excavations and Trenching Standards. Contractor shall designate a "Competent Person" 29 CFR 1926.32(f) who shall be responsible for inspections of excavations on a daily basis and document and maintain daily trenching and excavation logs per OSHA 29 CFR 1926.
 2. New York State Department of Labor, Rule. No. 23 of the Industrial Code – "Protection in Construction, Demolition and Excavation Operations".

3.2 EXAMINATION

- A. Examine area where excavation is to occur. Identify and locate all utility lines, piping and conduit.
- B. Verify fill materials to be used are acceptable.
- C. Verify that all subsurface installations for the project have been inspected and are ready for backfilling
- D. Verify that foundation walls are properly shored and braced to withstand lateral soil pressures created when backfilled material is placed against such walls

- E. Verify that underground tanks are anchored to their own foundation to avoid flotation after backfilling

3.3 PREPARATION

- A. Inspect spaces to be backfilled and remove all unsuitable materials including sheeting, bracing, forms and debris prior to commencing backfilling operations.
- B. Identify known underground, above ground, and aerial utilities. Stake and flag locations.
- C. Protect above and below grade utilities which are to remain.
- D. Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.
- E. Protect benchmarks, existing structures, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.

3.4 GENERAL EXCAVATION

- A. Excavate in a manner which will preserve material below the outside indicated lines of excavation. If solid rock, loose rock, or hardpan, or combinations thereof, exist at subgrade elevation, excavate not less than 12 inches into that rock or hard pan, or both, across the width and length of that excavation. Remove unsuitable subgrade material to depth required by the Engineer. Allow adequate working space to install forms and ensure safety of personnel. Place excavated material at distance from edge not less than one-half the final depth of excavation. Excavation for the convenience of Contractor shall conform to limits set by the Engineer.
- B. Conform to elevations and dimensions shown on the drawings within a tolerance of plus or minus 0.10 foot and extending a sufficient distance from footings and foundations to permit placing and removal of concrete form work, other construction, and inspection.
- C. Underpin adjacent structures which may be damaged by excavation work, including utilities and pipe chases.
- D. Excavate subsoil required to accommodate building foundations, slabs-on-grade paving and site structures, and construction operations.
- E. Machine-slope banks to angle of repose or less, until shored.
- F. Excavation cut not to interfere with normal 45-degree bearing splay of foundation. Undercutting of excavation faces will not be permitted.
- G. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- H. Hand trim excavation to required undisturbed subgrade. Remove loose matter.

- I. Remove lumped subsoil, boulders, and rock under 1 cubic yard, measured by volume. Refill voids with Class D concrete or compacted gravel/crushed stone.
- J. Should the subgrade become saturated, undercutting and replacement of unacceptable material shall be the responsibility of the Contractor. Replacement material shall be NYS DOT subbase course 304 Type 2 fill compacted to density equal to or greater than requirements for subsequent backfill material; or Class D concrete. The cost replacement, including any tests associated therewith, shall be borne by Contractor.
- K. Notify Engineer of unexpected subsurface conditions, or of questionable soils encountered at required subgrade elevations, and discontinue work in area until notified to resume operations.
- L. Should the Contractor, through negligence or otherwise carry his excavation below the designated subgrade, Class D concrete or such other materials as may be approved by the Engineer, shall be furnished and placed as backfill in sufficient quantities to reestablish the designated subgrade surface. Granular material used for backfilling shall be spread and compacted in conformance with the requirements of Sections 31 23 24 to the percentage compaction outlined therein. The cost of this refilling operation, including any tests associated therewith, shall be borne by Contractor.
- M. Remove excess excavated material not being reused from site.

3.5 TRENCH EXCAVATION

- A. Trench Width:
 - 1. Maintain the minimum trench width adequate to place, joint and backfill the pipe or conduit properly. Unless otherwise indicated on the Contract Drawings, the clear width of the trench at the level of the top of the pipe shall be outside diameter of the pipe barrel plus 2 feet for pipe more than 12 inches in diameter, and 3 feet for pipes less than 12 inches in diameter, unless otherwise approved by the Engineer. The sidewalls of pipe trenches shall be as near to vertical as practicable.
 - 2. In sheeted trenches, measure the clear width of the trench at the level of the top of the pipe to the inside of the sheeting.
 - 3. Pipes placed in trenches wider than specified above or shown on the Contract Drawings shall be redesigned or provided with concrete cradles or encasement as directed by the Engineer at no additional cost to the Owner.
- B. Length of Excavation: Make excavation for the sewers, drains, ducts, conduits or pipe lines only a reasonable distance in advance of pipe laying, at the discretion of the Engineer, and as may be indicated by the supply of materials on hand.
- C. Depth of Excavation:
 - 1. Excavation depth for pipelines shall be as required to meet lines, grades and bedding material depths shown on the Contract Drawings.

2. Where no bedding material depth is indicated on the Contract Drawings, the bedding material depth under the pipe bottom of 1/6th the pipe diameter or 6-inches, whichever is greater; or as directed by the Engineer.
- D. Preparation of Trench Bottom:
1. The bottom of the trenches shall be prepared to conform to the grade of the pipe and the bottom of the foundation of structures.
 2. The bottom of trenches shall be shaped as shown on the details of the drawings to provide uniform bearing and support for the bottom quadrant of each section of pipe. Trench bottom shall be recessed for pipe bells and couplings to eliminate point bearing.
 3. Precautions shall be exercised to ensure that pipes, when installed, will not rest on rock, masonry or any other materials which would present a nonuniform foundation.
 4. Where two or more pipes are to be laid in the same trench, the Contractor shall excavate the trench so that all pipes are laid on undisturbed material.
- E. Unyielding Material at Bottom of Trench
1. When unyielding material is encountered in the bottom of the trench, the unyielding material shall be excavated to a depth below the normal soil conditions bedding line of 1/6th the pipe diameter or 6-inches, whichever is greater; or to such depth as directed by the Engineer. The excavated space shall be backfilled with suitable material in accordance with the requirements of Article 2.2 of this Specification.
- F. Rock at Bottom of Trench
1. When rock is encountered in the bottom of the trench, the rock shall be excavated to a depth below the normal soil conditions bedding line of 1/6th the pipe diameter or 6-inches, whichever is greater; or to such depth as directed by the Engineer. The excavated space shall be backfilled with suitable material in accordance with the requirements of Article 2.2 of this Specification.
- G. Unstable Material at Bottom of Trench
1. When the material at the bottom of a trench is unstable, as determined by the Engineer, it shall be removed to such depth as directed, and backfilled with suitable material in accordance with the requirements of Article 2.2 of this Specification.

3.6 EXCAVATION FOR STRUCTURES

- A. Conform to elevations, lines, and limits indicated. Excavate to a vertical tolerance of plus or minus 1 inch. Extend excavation a sufficient lateral distance to provide clearance to execute the Work.
- B. Footings and Foundations: The foundation bearing grade will be established just prior to constructing the concrete foundations when concrete is to bear on undisturbed soil.
1. Stepping Footings: Cut sloping surfaces under footings, foundations, steps, and where required for other Work as indicated.

2. Pile Foundations: Stop excavations 6 to 12 inches above the bottom of pile cap elevation before the piles are placed. After pile installation, remove loose and displaced material and excavate to final grade, leaving a solid base to receive concrete pile caps.
 3. Where footings and other Work requiring similar soil support will rest entirely on rock, remove loose soil and loose rock and place concrete to the required elevations. Where footings and other Work requiring similar soil support will rest partially on rock and partially on soil, immediately notify the Engineer before any backfilling or concrete placement occurs; the Engineer will determine the correct foundation treatment for the Work.
- C. Slabs and Floors: Excavate to the following depths below bottom of concrete for addition of select granular material:
1. Interior Floors: 6 inches unless otherwise indicated.
 2. Exterior Slabs and Steps: 12 inches unless otherwise indicated.
- D. Unauthorized Excavations: Unless otherwise directed, backfill unauthorized excavation under footings, foundation bases, and retaining walls with compacted select granular material without altering the required footing elevation. Elsewhere, backfill and compact unauthorized excavation as specified for authorized excavation of the same classification, unless otherwise directed by the Engineer.
1. Unauthorized excavations under structural Work such as footings, foundation bases, and retaining walls will be reported immediately to the Engineer before any concrete or backfilling Work commences.
- E. Removal of Unsuitable Material Beneath Structures and Other Improvements: Excavate encountered unsuitable materials, which extend below required elevations, to additional depth as directed by the Engineer. Have cross sections taken, under the supervision of an independent Land Surveyor, to determine the quantity of such excavation. Do not backfill this excavation prior to quantity measurement.

3.7 EXCAVATION FOR APPURTENANCES

- A. Provide excavation for manholes, catch-basins, inlets, vaults, chambers and other similar structures.
- B. Clearances:
1. Leave a minimum of 12-inches clear between the outer surfaces of structures and the face of the excavation or members of the Excavation Protection System.
 2. Excavation shall be of sufficient size to permit the placement and removal of forms for the full length and width of concrete structures, and structure footings and foundations.
- C. Depth of Excavation: Unless otherwise indicated on the Contract Drawings the excavation for manholes, catch-basins, inlets, vaults, chambers and other similar structures shall extend a minimum of 12 inches below the planned base elevation.

- D. When the material at the bottom of the excavation is unstable, as determined by the Engineer, it shall be removed to such depth as directed, and backfilled with suitable material in accordance with the requirements of Article 3.1.G of this Specification.

3.8 PREPARATION OF SUBGRADE

- A. Subgrade is the lowest elevation of excavation required to accommodate the indicated construction.
- B. Do not place spread, roll, nor compact material that is saturated, devoid of moisture, frozen, or thawing.
- C. Adhere to the following for areas on which fill will be placed:
 - 1. Remove vegetation, debris, unsatisfactory or deleterious soil materials and obstructions from ground surface prior to placement of fills. Bench sloped surfaces steeper than 1 vertical to 4 horizontal. Bench width shall be determined by construction equipment. Minimum height of bench is 3 feet.
 - 2. When existing ground surface has a density less than that specified under Section 31 23 24 – Compaction, for the particular area classification, break up the ground surface and compact to required depth as directed by the Engineer.
- D. Proof Rolling of subgrade
 - 1. All subgrade surfaces, including areas requiring removal of existing fill, shall be proof-rolled by means of heavy rollers to locate and permit timely correction of subgrade deficiencies, which will adversely affect the performance of the pavement structure. Equipment capable of providing a minimum weight of ten (10) tons shall be available as required by the Engineer.
 - 2. In cut sections, proof-rolling of the subgrade surface shall be performed to determine the location and extent of areas below subgrade surface that may require subgrade undercutting. Should any portion of the cut subgrade surface fail to provide satisfactory support for the proof-rolling operation, the Engineer may order corrective undercut and backfill performed.
 - 3. In embankment sections, proof-rolling of the subgrade surface shall be performed to determine the uniformity of the compaction below the subgrade surface and to locate subgrade deficiencies requiring corrective work. Any deficiencies discovered during proof-rolling operations shall be corrected in a manner satisfactory to the Owner and/or Engineer. After all corrective work has been completed, the surface shall be proof-rolled again. Corrective work shall not be considered complete and acceptable until the embankment shows satisfactory and uniform response to the proof-rolling operations. All Work necessary and required to correct subgrade deficiencies in embankment sections shall be at the Contractor's expense.
- E. Removal of Fill in Building Areas
 - 1. Existing fill material encountered within building footprint areas shall be removed. The removal of existing fill shall extend from a point 5 feet outside of the footing line downward at 45 degrees to the underlying sand strata or material determined acceptable by the Engineer.

2. The base material shall be proof-rolled and approved by the Engineer.
 3. Backfill with acceptable materials in accordance with the specifications herein.
- F. Unyielding Material in Bottom of Excavation
1. When unyielding material is encountered in the bottom of the trench, the unyielding material shall be excavated to depth of 12-inches, or to such depth as directed by the Engineer. The excavated space shall be backfilled with NYSDOT Subbase Course Type 4 or with suitable material as directed by the Engineer.
- G. Rock in Bottom of Excavation
1. When rock material is encountered in the bottom of the excavation, the rock shall be excavated to depth of 12-inches, or to such depth as directed by the Engineer. The excavated space shall be backfilled with NYSDOT Subbase Course Type 4 or with suitable material as directed by the Engineer.
- H. Unstable Material in Bottom of Excavation
1. When unstable material is encountered in the bottom of the trench, the unstable material shall be removed to such a depth as directed by the Engineer. The excavated space shall be backfilled with NYSDOT Subbase Course Type 4 or with suitable material as directed by the Engineer.

3.9 BACKFILLING AND COMPACTION

- A. General Requirements
1. Backfill areas to required contours, grades and elevations with unfrozen materials.
 2. Any excavation shall be backfilled and compacted as specified for that area. Where fill is placed adjacent to a wall, the difference in elevation between the top of fill on either side of the wall shall be no more than one foot unless the wall is adequately braced, or the wall is designed to withstand the pressures due to unbalanced fill heights.
 3. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
 4. Backfill material shall be inspected prior to placement and all roots, vegetation, organic matter, or other foreign debris shall be removed. Stones larger than 12 inches in any dimension shall be removed or broken. Stones shall not be allowed to form clusters with voids.
 5. Backfill material shall not be placed when moisture content is more than two percent above optimum or is otherwise too high to allow proper compaction. When material is more than two percent below optimum or is otherwise too dry for adequate compaction, water shall be added to the extent necessary.
 6. Hydraulic compaction by ponding or jetting will not be permitted except in very unusual conditions and then only upon written request and demonstration of its effectiveness by the Contractor and the written acceptance by the Engineer.
 7. Place and compact fill materials in continuous layers to meet appropriate requirements of Table No. 1 of Section 31 23 24.
 8. Employ a placement and compaction method consistent with Section 31 23 24 that does not disturb or damage adjacent walls, drainage systems, damp-proofing,

- waterproofing, protective coverings, utilities in trenches, underground conduits or tanks.
 9. Maintain optimum moisture content of backfill materials to attain required compaction density.
 10. Backfill against supported foundation walls. Do not backfill against unsupported foundation walls.
 11. Rough grade all backfilled and filled areas to meet subsequent topsoiling or paving requirements. Make grade changes gradual. Blend slopes into level areas.
 12. Elevations: The Contractor shall furnish to the Engineer the final elevation of each accepted compacted lift before placing or compacting the next succeeding lift
 13. Remove surplus backfill materials from site.
 14. Leave fill material stockpile areas completely free of excess fill materials.
- B. Trench Backfill
1. Backfill trenches to the grade shown
 2. Replace unyielding material removed from the bottom of the trench with suitable material in accordance with the requirements of Article 2.2 of this Specification.
 3. Replace rock removed from the bottom of the trench with suitable material in accordance with the requirements of Article 2.2 of this Specification.
 4. Replace unstable material removed from the bottom of the trench with suitable material in accordance with the requirements of Article 2.2 of this Specification.
 5. Backfill trenches in such a way as to prevent dropping material directly on top of any conduit or pipeline. Do not allow material from bucket to fall directly on a structure, pipe or conduit. In all cases lower the bucket so that the shock of falling material will not cause damage.
 6. Provide bedding of the type and thickness shown on the Contract Drawings. Where no material is indicated, provide material in accordance with the requirements of Article 2.2 of this Specification.
 7. Place initial backfill material and compact it with approved tampers to a height of at least 1 foot above the pipe or conduit. The backfill shall be brought up evenly on both side of the pipe or conduit for its full length. Take care to ensure thorough compaction of fill under the pipe haunches.
 8. The remainder of the trench shall be backfilled with material conforming to the requirements of Article 2.2 of this Specification.
 9. All pipelines shall be backfilled prior to testing.
 10. Whenever trenches have not been properly backfilled, or settlement occurs, they shall be refilled, smoothed off and finally made to conform to the surface of the ground. Backfilling shall be carefully preformed and the original surface including pavement or other surfacing above the settled areas shall be restored to the full satisfaction of the Engineer, and at no additional cost to the Owner.
- C. Backfill for Appurtenances
1. Backfill excavations as soon as, in the opinion of the Engineer, it can be done without injury to the concrete or structure.
 2. Deposit the material and compact it as specified in Section 31 23 24.

3. Bring up backfill evenly on all sides of the structure to prevent eccentric loading and excessive stress.
- D. Embankments and Fill
1. Fill sections and embankments shall be acceptable material and defined herein and deposited in successive lifts with a loose thickness as specified in Section 31 23 24.
 2. The size of rock particles within the fill in building areas and in the upper three (3) feet of paved areas shall not exceed six (6) inches. The maximum size of rock particles below the upper three (3) feet in paved areas may be increased to twelve (12) inches provided that the larger rock particles are well choked and blended with the finer soils.
 3. Embankments shall be pitched to provide drainage at the close of each day's operations. In no case shall the slope of fill construction exceed a ratio of 2 horizontal to 1 vertical.
- E. Structure Backfill
1. Backfill excavations as promptly as work permits but not until completion of the following:
 - a. Acceptance by the Engineer of construction below finish grade including, where applicable, leakage tests, underdrain installation, damp proofing, waterproofing and perimeter insulation.
 - b. Removing of trash and debris.
 - c. Compact stripped surfaces to 95 percent of maximum density
 - d. Place backfill and fill materials in layers not more than eight inches thick in loose depth unless otherwise specified.
 - e. Before compaction, moisten or aerate each layer as necessary to facilitate compaction to the required density. Do not place backfill or fill material on surfaces that are muddy, frozen, or covered with ice.
 - f. Place fill and backfill against foundation walls, and in confined areas not easily accessible by larger compaction equipment, in maximum six-inch-thick loose depth layers.
 2. Concrete Walls
 - a. Do not place fill or backfill against concrete walls until the walls have attained 70 percent of their design strength. Place backfill against walls of structures containing basements or crawl spaces only after the first floor structural members are in place and any concrete components of the first floor structural system have attained 70 percent of their concrete design strength.
 - b. Prevent wedging action of backfill against structures backfilled on both sides, by placing backfill uniformly around structure so that the elevation on each side never differs by more than 24 inches.
 3. Foundation Drains:
 - a. Line pipe trench loosely with filter fabric. Lap successive sheets 18 inches.

- b. Place underdrain filter material a minimum of 4 inches deep under pipe and 6 inches on both sides and over top of drain pipe.
- c. Completely wrap underdrain filter material with filter fabric.
- d. Within two weeks complete balance of backfill with selected fill extending 2 feet out from foundation wall and up to 6 inches below finished grade.

F. Compaction

- 1. Compaction shall be in accordance with the requirements of Section 31 23 24.

3.10 BURIED TAPE

- A. Provide buried piping, conduit and utilities with identification tape.
- B. Unless otherwise indicated on the Contract Drawings, tape shall be buried 12 inches below finished grade, under pavements and slabs; and 6 inches below top of subgrade.

3.11 TOLERANCES

- A. Top Surface of Backfilling Under Pavement Subgrade ± 1 inch from required elevations.
- B. Top Surface of General Backfilling ± 1 inch from required elevations.
- C. Top Surface of Structural Backfill: ± 1 inch from required elevations

3.12 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01 45 00.
- B. Tests and analysis of fill material will be performed in accordance with ASTM D1557 and with Section 31 23 24.
- C. Compaction testing shall be performed by an independent testing firm engaged by the Contractor in accordance with the requirements of Section 31 23 24.
- D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.
- E. Provide for visual inspection of bearing surfaces

3.13 PROTECTION OF FINISHED WORK

- A. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation, from freezing.

- C. Exposed subgrade surfaces shall remain undisturbed, drained, and maintained as uniform, plane areas, shaped to receive the foundation components of the building or structure.

3.14 MAINTENANCE

- A. Protection of Graded Areas: Protect newly graded areas from construction traffic and erosion. Keep free of trash and debris and provide temporary drainage as required. Repair and reestablish grades in settled, eroded and rutted areas to specified tolerances
- B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required moisture and density prior to further construction. Remove saturated or softened soil as directed by the Engineer.
 - 1. Make one field density test or subgrade at each component location. In each compacted fill layer, make one field density test at each compaction location.
 - 2. Backfill: Take one field density test at each backfill location as directed.

– END OF SECTION –

SECTION 311000 - SITE CLEARING

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. Protecting existing vegetation to remain.
 - 2. Removing existing vegetation.
 - 3. Clearing and grubbing.
 - 4. Stripping and stockpiling topsoil.
 - 5. Removing above- and below-grade site improvements.
 - 6. Disconnecting, capping or sealing, and removing site utilities or abandoning site utilities in place.
 - 7. Temporary erosion and sedimentation control.

1.3 DEFINITIONS

- A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.
- C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow.
- D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.
- E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Rye Playland prior to clearing.

1.5 MATERIAL OWNERSHIP

- A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.6 INFORMATIONAL SUBMITTALS

- A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
 - 1. Use sufficiently detailed photographs or video recordings.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.
- B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.7 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
 - 1. Do not proceed with work on adjoining property until directed by Architect.
- C. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premise upon their request.
- D. Utility Locator Service: Notify Rye Playland for area where Project is located before site clearing.
- E. Do not commence site clearing operations until temporary erosion- and sedimentation-control measures are in place.
- F. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 310000 "Earthwork."
 - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed according to requirements in Section 015639 "Temporary Tree and Plant Protection."
- C. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

- A. Protect trees and plants remaining on-site.
- B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations.

CONTRACT No. 22-523
DIVISION 31 - EARTHWORK

3.4 EXISTING UTILITIES

- A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.
 - 1. Verify that utilities have been disconnected and capped before proceeding with site clearing.
- B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
 - 1. Arrange with utility companies to shut off indicated utilities.
 - 2. Owner will arrange to shut off indicated utilities when requested by Contractor.
- C. Locate, identify, and disconnect utilities indicated to be abandoned in place.
- D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect not less than one week in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.
- E. Excavate for and remove underground utilities indicated to be removed.
- F. Removal of underground utilities is included in earthwork sections; in applicable fire suppression, plumbing, HVAC, electrical, communications, electronic safety and security, and utilities sections; and in Section 024116 "Structure Demolition" and Section 024119 "Selective Demolition."

3.5 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - 2. Grind down stumps and remove roots larger than 3 inches (75 mm) in diameter, obstructions, and debris to a depth of 18 inches (450 mm) below exposed subgrade.
 - 3. Use only hand methods or air spade for grubbing within protection zones.
 - 4. Chip removed tree branches and stockpile in areas approved by Architect.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches (200 mm) and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.

CONTRACT No. 22-523
DIVISION 31 - EARTHWORK

- B. Strip topsoil to depth of 6 inches (150 mm) in a manner to prevent intermingling with underlying subsoil or other waste materials.
 - 1. Remove subsoil and non-soil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches (50 mm) in diameter; trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.
 - 1. Limit height of topsoil stockpiles to 72 inches (1800 mm).
 - 2. Do not stockpile topsoil within protection zones.
 - 3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
 - 4. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.7 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
 - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
 - 2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Burning tree, shrub, and other vegetation waste is not permitted.
- C. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

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SECTION 31 19 13 - GEOTECHNICAL INSTRUMENTATION AND MONITORING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Geotechnical Instrumentation and Monitoring
- B. Related Sections:
 - 1. Section 31 00 00 – Excavation
 - 2. Section 31 62 15 – Drilled Micropiles

1.2 REFERENCES

- A. General Requirements:
 - 1. Except as modified by governing codes and by this Specification, comply with the applicable provisions and recommendations of latest editions of the following.
 - 2. Where the language in any of the documents referred to herein is in the form of a recommendation or suggestion, such recommendations or suggestions shall be deemed to be mandatory under this Contract unless otherwise directed by the Engineer.
 - 3. Conflicts: Conform to requirements of cited standard unless specified otherwise. In case of apparent conflict between standards, or between standards and the specifications herein, the more stringent shall apply unless otherwise directed by the Engineer.
- B. New York State Department of Transportation Engineering Instructions
 - 1. EI 05-044 – Special Specification for Building Condition Survey(s) and Vibration Monitoring (Nonblasting)
- C. Occupational Safety and Health Administration (OSHA).
- D. All other applicable Federal, State and Municipal codes, rules and regulations

1.3 SUBMITTALS

- A. Building Condition Survey: Prepare a “Building Condition Survey” of all structures and facilities within the limits specified per Section 01 32 33.
- B. Vibration Monitoring Plan: Prepare a “Vibration Monitoring Plan” of the existing Dragon Coaster Vendor and surrounding areas in accordance with the requirements of New York State Department of Transportation Engineering Instruction EI 05-044 – Special Specification for Building Condition Survey(s) and Vibration Monitoring (Nonblasting)
- C. Submittals as outlined in EI 05-044.

1.4 QUALITY ASSURANCE

- A. Throughout the process of the work of this Section, provide at least one person who shall be thoroughly familiar with the specified requirements, completely trained and experienced in the necessary skills and who shall be present at the site and direct the work performed under this Section.
- B. In the performance of the work of this Section, use an adequate number of trained workmen experienced in the preparation of Building Condition Surveys and in conducting Vibration Monitoring.

1.5 COORDINATION

- A. Coordinate the work of this Section with other sections of work and trades

PART 2 PRODUCTS – Not Used

PART 3 EXECUTION

3.1 GENERAL

- A. The Contractor shall prepare a Building Condition Survey and conduct Vibration Monitoring of the Dragon Coaster Vendor and surrounding area within the limits specified in Table 1 below.
- B. The Building Condition Survey and Vibration Monitoring shall be conducted and provided in accordance with the requirements of NYSDOT Engineering Instruction EI 05-044 “Special Specification for Building Condition Survey(s) and Vibration Monitoring.”
 - 1. EI 05-044 subsections “METHOD OF PAYMENT” and “BASIS OF PAYMENT” shall not apply.
 - 2. “Engineer” shall be substituted for the terms “Deputy Chief Engineer (Technical Services)”, “Engineer”, and “Geotechnical Engineering Bureau Geology Section”.
 - 3. EI 05-044 vibration criteria shall be replaced by those identified in Table 2 of this section.

TABLE 1
LIMITS OF BUILDING CONDITION SURVEY
AND
VIBRATION MONITORING PLAN

Type of Work	Distance from Work
Pile Driving	100 ft

- C. Vibration Limits at Existing Structures

1. The Contract shall inform the Engineer immediately each time measured particle velocities exceed 85% of the allowable Peak Particle Velocity (PPV) in Table 2 below.
2. If the measured velocities exceed the maximum allowable PPV's, the Contractor shall stop operations immediately and revise equipment and procedures to reduce vibrations to allowable levels, at no additional cost to the County.
3. The maximum PPV shall be the maximum of three components measured in three mutually perpendicular directions (transverse, vertical, and longitudinal)
4. The Contractor shall be solely responsible for and shall repair any and all vibration damage caused by its construction activities.

TABLE 2
VIBRATION CRITERIA AT STRUCTURES

Construction Category	Maximum Allowable Peak Particle Velocity (PPV) on Ground Vibration (in/sec)
Reinforced concrete structures Concrete > 1 day old (See Note 1)	0.5
Green concrete Concrete <1 day old (See Note 1)	0.2
Steel or timber structures No plaster	0.5
Engineered masonry No plaster	0.3
Non-engineered timber and masonry structures	0.2
Structures extremely susceptible to vibration damage	0.12
Buried utilities and pipelines	1.25
Notes:	
1. The Maximum Allowable PPV for concrete shall be reduced by the following factors based on distance per the following equation:	
$\text{Allowable PPV} = \text{DF} \times \text{Max Allowable PPV}$	

TABLE 3
DISTANCE FACTORS (DF)

Distance	Distance Factor DF
0 – 50 ft	1.0
50 – 150	0.8
150 - 250	0.7
>250 ft	0.6

3.2 EXAMINATION

- A. Verify site conditions and note subsurface irregularities affecting Work of this section.

3.3 PREPARATION

- A. Identify limits of Building Condition survey and Vibration Monitoring.
- B. The Contractor shall be responsible for obtaining permissions for conducting the work of this Section

3.4 NOTIFICATION OF ENGINEER

- A. Notify the Engineer before commencing the Building Condition Survey and Vibration Monitoring.

– END OF SECTION –

SECTION 31 22 13 – ROUGH GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Removal and storage of subsoil.
- B. Cutting, grading, filling and rough contouring the site prior to placement of topsoil or pavement base for final grading.

1.02 RELATED SECTIONS

- A. Section 311000 – Site Clearing.
- B. Section 312316 – Excavation – Removal of Unsuitable Soils.
- C. Section 312323.13 – Backfilling – Replacement of Unsuitable Soils.

1.03 REFERENCES

- A. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. Rammer and 18 inch Drop.

1.04 SUBMITTALS

- A. Sieve Analysis: Submit a sieve analysis of all types of fill material to be used.

1.05 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of utilities remaining, by horizontal dimensions, elevations or inverts, and slope gradients.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Subsoil: Reused excavated material, graded, free of lumps, rocks and gravel larger than 3 inches in size, debris and contaminants.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify site conditions.
- B. Verify that survey benchmark and intended elevations for the work are as indicated.

3.02 PREPARATION

- A. Identify required lines, levels, contours and datum.
- B. Identify known underground, aboveground and aerial utilities. Stake and flag locations.
- C. Coordinate the removal or relocation of utilities with the necessary utility companies.
- D. Protect above and below-grade utilities that are to remain.
- E. Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.
- F. Protect benchmarks, existing structures, fences, sidewalks, paving and curbs from excavation equipment and vehicular traffic.

3.03 APPLICATION

- A. Excavate subsoil from areas to be further excavated, re-landscaped or regraded. Do not excavate wet subsoil.
- B. Stockpile in area designated on site. Remove excess subsoil not being reused from site.
- C. Stockpile subsoil to a height not exceeding 8 feet. Cover to protect from erosion.
- D. When excavation through roots is necessary, perform work by hand and cut roots with sharp axe.
- E. Fill areas to contours and elevations with unfrozen subsoil material with allowances made for topsoil, aggregate base course or paving.
- F. Place and compact subsoil fill material in continuous layers not exceeding 6 inches compacted depth, compacted to 95 percent maximum dry density in accordance with ANSI/ASTM D1557.
- G. Maintain optimum moisture content of fill materials to attain required compaction density.
- H. Make grade changes gradual. Blend slope into level areas.
- I. Remove surplus fill materials from site.

3.04 TOLERANCES

- A. Maximum Variation From Top Surface of Subgrade: 0.5 inch.

END OF SECTION

SECTION 31 23 16 - EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Excavation for building foundations.
- B. Excavation for slabs-on-grade, paving and landscaping.
- C. Excavation for site structures.
- D. Site excavation.

1.02 RELATED SECTIONS

- A. Section 312213 – Rough Grading.
- B. Section 312323.13 - Backfill: Backfilling excavated material.

1.03 QUALITY ASSURANCE

- A. Do not excavate wet or frozen materials without written approval from the Engineer.
- B. Provide safety barricades around open excavations.

1.04 FIELD MEASUREMENTS

- A. Verify that survey benchmark and intended elevations for the work are as indicated.

PART 2 PART 2 - PRODUCTS

Not Used.

PART 3 PART 3 - EXECUTION

3.01 PREPARATION

- A. Identify required lines, levels, contours and datum.
- B. Identify known underground, above ground and aerial utilities. Stake and flag locations.
- C. Notify utility company to remove or relocate utilities, if required.
- D. Protect above and below grade utilities which are to remain.
- E. Protect plant life, lawns and other features remaining as a portion of final landscaping.

CONTRACT No. 22-523
DIVISION 31 - EARTHWORK

- F. Protect bench marks, existing structures, fences, sidewalks, paving and curbs from excavation equipment and vehicular traffic.
- G. Notify the Engineer prior to commencement of excavation.

3.02 EXCAVATION

- A. Underpin adjacent structures that may be damaged by excavation work, including utilities and pipe chases.
- B. Excavate subsoil required to accommodate landscaping and construction operations to the limits as indicated on the plans.
- C. Machine slope banks to angle of repose or less, until shored.
- D. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- E. Hand trim excavation. Remove loose matter.
- F. Remove lumped subsoil, boulders, and rock.
- G. Notify Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.
- H. Correct unauthorized excavation at no extra cost to Owner in accordance with Section 312323.13.
- I. Stockpile excavated material in area designated on site and remove excess material not being reused from site.

3.03 FIELD QUALITY CONTROL

- A. Provide for visual inspection of bearing surfaces.

3.04 PROTECTION

- A. Protect work and adjacent areas from construction activities.
- B. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.
- C. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION

SECTION 31 23 19 - DEWATERING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Dewatering System.
 - 2. Surface Water Control System.
 - 3. Monitoring Wells.
 - 4. System Operation and Maintenance.
 - 5. Dewatering Effluent Disposal.

- B. Related Sections:
 - 1. Section 31 00 00 - Earthwork

1.2 REFERENCES

- A. Storm Water Pollution Prevention Plan (SWPPP)

- B. ASTM standards applicable to piping, equipment and other items required for a complete dewatering system

1.3 DEFINITIONS

- A. Dewatering System:
 - 1. System of wells, well points, sumps, ejectors, pumps, power supply, effluent treatment equipment and equipment designed by Contractor, submitted to and approved by the Engineer prior to dewatering, that will effectively dewater the site as required herein. Adequate observation wells shall be included in the dewatering system to verify drawdown levels inside the excavation area and monitor groundwater levels outside the limits of the excavation near adjacent structures.

- B. Dewatering includes the following:
 - 1. Lowering of ground water table and intercepting horizontal water seepage to prevent ground water from entering, excavations and trenches.
 - 2. Reducing piezometric pressure within strata to prevent failure or heaving of excavations and trenches.
 - 3. Disposing of removed water.

- C. Construction Dewatering:
 - 1. Controlling groundwater levels, hydrostatic pressures and controlling surface water, such that excavation required on the Contract Drawings can be performed to required depths in substantially dry and stable conditions.

- D. Surface Water Control: Removal of surface water within open excavations.

1.4 SYSTEM DESCRIPTION

- A. Provide dewatering and surface water control systems to permit Work to be completed on dry and stable subgrade.
- B. Provide monitoring wells and monitoring equipment to obtain meaningful observations of conditions affecting excavation, adjacent structures, and adjacent water wells.
- C. Furnish standby equipment stored at Project site and ready for immediate use upon failure of dewatering equipment.

1.5 PERFORMANCE REQUIREMENTS

- A. The Contractor's attention is directed to:
 - 1. Special Notices:
 - a. Protection of Water Resources and the Environment
 - b. Department of Environmental Facilities (DEF) Environmental Management System (EnvMS) Requirements – Soil Erosion and Sediment Control Activities.
 - 2. General Clause 14.
- B. The Contractor shall design, provide, install, operate, maintain and remove the Dewatering System as necessary to:
 - 1. Lower and maintain groundwater levels and hydrostatic pressures to 2 feet below the prevailing excavation level or to a point no higher than 2 feet above the top of an impermeable stratum, if the subgrade is in the impermeable stratum. Groundwater levels shall be lowered for a time period as necessary to ensure adequate factor of safety for the constructed structure.
 - 2. Maintain stability of sides and bottoms of excavations.
 - 3. Control and remove seepage and surface water into excavations.
 - 4. Relieve hydrostatic pressures in confined water bearing strata below excavation to eliminate risk of uplift or other instability of excavation.
 - 5. Prevent damage to adjacent properties, buildings, structures, utilities, and facilities from construction operations.
 - 6. Prevent loss of fines, development of quick condition, or softening of foundation subgrade.
 - 7. Allow subsequent work to be safely performed and not result in damage to adjacent properties, buildings, structures, utilities and other work.
- C. The method of dewatering and control of water both inside and outside the excavation shall be selected by the Contractor who shall be solely responsible for the location, arrangement and depth of any system(s) selected to accomplish the work. The Contractor shall construct protective works as necessary to dewater, cut off porous zones of fill and direct the flow of water from whatever source away from the excavations and adjacent areas. Protective works shall include slurry methods, grouting, clay seepage plugs, toe drains with appropriate filters, deep wells, wellpoints, sumps, dikes, ditches and all

supporting features as required, but not specifically shown on the Contract Drawings, to permit construction in the dry.

- D. Dewatering Effluent Disposal
1. The Contractor shall manage and dispose of effluent generated during dewatering activities in accordance with SWPPP.
 2. Dewatering effluent shall not be discharged to the sanitary sewer.
 3. The Contractor shall provide appropriately sized settling tanks, basins, or other devices to remove suspended solids from the dewatering effluent; and control effluent discharge rates as required by the SWPPP.
 - a. Sampling of the tank, basin or other device effluent and measurement of discharge flow rates shall be as required by disposal/discharge criteria.
 - b. The tanks, basins or other devices shall be provided with an overflow collection system or other safeguards to prevent accidental release of dewatering effluent.
 - c. Routine inspection of the tanks, basins or other devices shall be carried out daily to ensure that their integrity is being maintained, and that all valves or openings are properly locked out to avoid accidental discharge
 - d. Settling tanks, basins or other devices shall be cleaned frequently to prevent excess deposition of solids which could overflow. Removed solids shall be classified and disposed of in accordance with applicable codes, rules and regulations.
 4. The Contractor shall provide appropriately sized oil/water separators to remove hydrocarbons, grease and other floatable materials from the dewatering effluent prior to discharge.
 5. The Contractor shall provide treatment for, or remove from the site to an approved disposal facility, all dewatering effluent that exceeds any limit set for discharge.
 - a. Classification and disposal shall be the responsibility of the Contractor.
 - b. No separate payment will be made for treatment or disposal of such effluent.

1.6 SUBMITTALS

- A. Review of the Dewatering System by the Engineer shall not in any way relieve the Contractor from full responsibility for the complete and adequate design and performance of the dewatering system to provide the necessary Construction Dewatering.
- B. Dewatering and Excavation Plan: A Dewatering and Excavation Plan shall be submitted to the Engineer at least 30 calendar days prior to the commencement of the dewatering work and, at a minimum, shall include the following:
1. Description and profile of geology, soil, and groundwater conditions.
 2. Detailed description of the Dewatering and Monitoring System installation including procedures for operation and maintenance of equipment, and description of emergency procedures to follow when problems arise
 3. Design calculations demonstrating the adequacy of the proposed Dewatering System, including depth to groundwater at excavation limits.

4. Calculations and requisite technical data on well screens and filter materials and gradations to demonstrate the adequacy of proposed systems to prevent the pumping of fines.
 5. Working drawings showing the Dewatering System to be used. Working Drawings shall include:
 - a. Arrangements, locations and depths of the Dewatering System
 - b. A complete description of equipment and materials to be used and the procedure to be followed in installation, operation and maintenance in relation to the proposed sequence of excavation, foundation construction and backfilling.
 - c. Layout and depth of monitoring wells, piezometers and flow measuring devices for system performance measurement.
 - d. Location and size of sumps, ditches and water discharge lines, including their relation to water disposal points
 - e. The proposed locations of points of effluent treatment equipment, effluent flow equalization tanks and discharge of water.
 - f. Proposed types and locations of proposed surface water control
 6. Standby equipment and standby power supply.
 7. Discharge details, metering, and reading schedules and the details of the settling tank and oil/water separator
 8. Methods to be used for drilling, construction, and development of wells and piezometers.
 9. Permits and Notifications
 - a. List of permits required
 - b. List of agencies having jurisdiction to be notified.
 - c. Schedule for obtaining permits
 - d. Schedule for the notification of agencies having jurisdiction.
 10. The dewatering and Excavation Plan shall be prepared by a Professional Engineers registered in the State of New York.
- C. Product Data: Submit data for each of the following:
1. Dewatering Pumps: Indicate sizes, capacities, priming method, motor characteristics.
 2. Pumping equipment for control of surface water within excavation.
- D. As-built Submittals: During installation of the dewatering system and prior to the start of Construction Dewatering, submit as-built conditions of the Dewatering System. As-built data are to include but are not limited to:
1. Plans and sections showing as-built locations, and surveyed elevations of the Dewatering System and its components.
 2. Drawings to indicate changes made to the original Working Drawings to accommodate field conditions and to comply with design standards.
 3. Details of installation including dimensions and materials used, description and drawings of all installations, all procedures, soil strata encountered and logs of soil samples.
- E. Field Reports: As specified in Field Quality Control article.

- F. The Contractor shall be responsible for compliance with all dewatering permit requirements once construction dewatering begins.

1.7 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations and depths of capped wells and piping abandoned in place.

1.8 QUALITY ASSURANCE

- A. Comply with authorities having jurisdiction for the following:
 - 1. Drilling and abandoning of wells used for dewatering systems.
 - 2. Water discharge and disposal from pumping operations.
- B. Obtain permit as required.
- C. Perform Work in accordance with all applicable Federal, State and Municipal codes, rules and regulations including revisions to date.

1.9 QUALIFICATIONS

- A. The dewatering work shall be performed by a specialty subcontractor specializing in and having experience installing and operating dewatering systems in similar subsurface conditions for at least 5 years.
- B. The Contractor may perform the dewatering work if he has experience conforming to the above requirements.
- C. The Contractor shall assume sole responsibility for dewatering and surface water control systems and for loss or damage resulting from partial or complete failure of protective measures and settlement or resultant damage caused by ground water control operations.
- D. Design, install, and monitor operation of dewatering under direct supervision of Professional Engineer registered in the State of New York having experience in the design of this Work

1.10 SEQUENCING

- A. Sequence work to obtain required permits before start of dewatering operations.
- B. Sequence work to install and test monitoring systems a minimum of one (1) week before testing and operating dewatering systems.
- C. Sequence work to install and test dewatering systems a minimum of one (1) week before starting excavation.

1.11 COORDINATION

- A. Coordinate work to permit the following construction operations to be completed on dry stable substrate.
 - 1. Excavation for structures.
 - 2. Trenching for utilities
- B. Coordinate the operation of his dewatering system with existing and proposed construction.

PART 2 PRODUCTS

2.1 GENERAL

- A. Materials and equipment used in the Dewatering System shall adhere to accepted industry standards and be in good operating condition and able to perform satisfactorily over the required duration of construction dewatering.
- B. Back up equipment for the Dewatering System shall be identical to the primary equipment and shall be available in operating condition at all times

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Construction Dewatering is required to protect foundation subgrades and to maintain dry conditions for construction. The Contractor shall maintain a continuous and completely effective Dewatering System as required during the duration of construction.
- B. The Contractor shall be prepared to modify the dewatering system and methods as required by actual field conditions encountered during construction, at no additional cost to the Owner.
- C. The Contractor shall measure water levels periodically in observation wells installed adjacent to nearby structures to ensure drawdown outside the excavation is within permissible limits specified in the Dewatering and Excavation Plan.
- D. Surface areas adjacent to the excavation shall be graded and/or curbed to prevent flow of surface water into the excavation.

3.2 EXAMINATION

- A. Conduct additional borings and investigations to supplement subsurface investigations as required to complete dewatering system design.
- B. Locate underground piping, conduit, and other structures.

3.3 PREPARATION

- A. Protect existing adjacent buildings, structures, and improvements from damage caused by dewatering operations.

3.4 TESTING

- A. The Contractor is responsible for monitoring his dewatering efforts to determine if the project requirements are being met. The Contractor shall provide observation wells and other means to monitor the dewatering as detailed in the Dewatering and Excavation Plan.
- B. Readings to determine the quantity of fines in the dewatering effluent shall be made a minimum of once every two weeks.

3.5 MONITORING WELLS

- A. Install monitoring wells at locations indicated in the Dewatering and Excavation Plan.
- B. Test each monitoring well point to verify installation is performing properly.
- C. Install piezometers, calibrate, and test for proper operation.
- D. Protect monitoring wells from damage by construction operations.
- E. Maintain accessibility to monitoring wells continuously during construction operations.
- F. Maintain monitoring wells until groundwater is allowed to return to normal level.

3.6 DEWATERING SYSTEM

- A. Install dewatering system in accordance with the Dewatering and Excavation Plan.
- B. Locate system components to allow continuous dewatering operations without interfering with installation of permanent Work and existing public rights-of-way, sidewalks, and adjacent buildings, structures, and improvements.
- C. Drill wells in sizes and to depth indicated. Provide temporary surface casing when required to stabilize soil while advancing well.
- D. Test wells for proper water flow through well screen and pumping rate for dewatering system operation. Repeat development until well meets performance requirements.
- E. Cover and seal top of well until pump is installed.
- F. Install pumps in accordance with manufacturer's instructions.
- G. Connect pumps to discharge header. Install valves to permit pump isolation.

3.7 SURFACE WATER CONTROL SYSTEM

- A. Provide ditches, berms, and other devices to divert and drain surface water from excavation area.
- B. Divert surface water and seepage water within excavation areas into sumps and pump in accordance with requirements of the Dewatering and Excavation Plan.
- C. Control and remove unanticipated water seepage into excavation.
- D. Direct surface water to minimize surface erosion, ponding and softening of slopes and berms, including haul roads and equipment working stations.
- E. Curbs shall be maintained and, where necessary, extended across intersections, curb cuts and defective curb sections. Surface cracks in the adjacent streets are to be sealed and re-sealed as necessary. Should adjacent settlement occur during the work, curbs shall be raised or water-tight mounds shall be installed as directed by the Engineer to prevent flow into the site.

3.8 SYSTEM OPERATION AND MAINTENANCE

- A. The Dewatering System shall provide for an uninterrupted flow of pumped water and shall be maintained and pumped as necessary to drawdown and maintain the groundwater levels as specified. Unless otherwise specified, pumping shall maintain those depressed levels until the permanent under drainage system has been installed, tested, accepted and is operational or until the permanent structure is capable of withstanding hydrostatic pressures as determined by the Engineer.
- B. The Contractor shall furnish, operate and maintain sufficient drainage and pumping facilities to dewater the site and its underlying soil. Dewatering operations shall operate in such a manner so that the excavation can proceed while maintaining stable slopes and the designed lateral support for the perimeter support of excavation walls, without disturbing the bearing subgrades for the structure. The ground water level as measured in monitoring wells shall be lowered and maintained at least two feet below the prevailing excavation level, or it shall be lowered to a point no higher than 2 feet above the top of impermeable stratum if the subgrade is in the impermeable stratum.
- C. The dewatering system shall be installed and operated in such a manner as to avoid the movement of fines or loss of ground below the bearing level and shall not influence the stability of surrounding areas. Well points and deep wells shall be properly sanded in and sumps shall be sheeted and provided with proper filter material.
- D. A sufficient number of monitoring wells shall be installed and water levels read by the Contractor, at least weekly, to demonstrate that the goals of the Dewatering System are being met. Water level readings shall be submitted within 24 hours to the Engineer. If applicable, the Contractor may make use of existing observation wells as shown on the Contract Drawings.

- E. Open pumping with sumps and ditches resulting in boils, loss of fines, softening of the ground or instability of slopes will not be permitted.
- F. Provide 24-hour supervision of dewatering system by personnel skilled in operation, maintenance, and replacement of system components.
- G. Conduct daily observation of dewatering system and monitoring system. Make required repairs and perform scheduled maintenance.
- H. Fill fuel tanks before tanks reach 25 percent capacity.
- I. Start emergency generators at least twice each week to check operating condition.
- J. When dewatering system cannot control water within excavation, notify the Engineer and stop excavation work.
 - 1. Supplement or modify dewatering system and provide other remedial measures to control water within excavation.
 - 2. Demonstrate dewatering system operation complies with performance requirements before resuming excavation operations.
- K. Modify dewatering and surface water control systems when operation causes or threatens to cause damage to new construction, existing site improvements, adjacent property, or adjacent water wells.
- L. Correct unanticipated pressure conditions affecting dewatering system performance.
- M. Do not discontinue dewatering operations without Engineer's approval.

3.9 DEWATERING EFFLUENT DISPOSAL

- A. Discharge dewatering effluent in accordance with the requirements of the Dewatering and Excavation Plan, and the SWPPP.

3.10 SYSTEM REMOVAL

- A. Remove dewatering and surface water control systems after dewatering operations are discontinued.
- B. Repair damage caused by dewatering and surface water control systems or resulting from failure of systems to protect property.

3.11 FIELD QUALITY CONTROL

- A. Survey existing adjacent buildings, structures, and improvements as indicated in the Dewatering and Excavation Plan to detect movement in comparison to original elevations during dewatering operations. Notify the Engineer immediately of measured movement.
- B. Submit initial installation reports including the following:

CONTRACT No. 22-523
DIVISION 31 – EARTHWORK

1. Installation and development reports for well points and pumps.
 2. Installation and baseline reports for monitoring wells and piezometers.
 3. Initial dewatering flow rates.
- C. Submit weekly monitoring reports including the following:
1. Dewatering flow rates.
 2. Piezometer readings.
 3. Maintenance records for dewatering and surface water control systems.

- END OF SECTION -

SECTION 31 23 23.13 - BACKFILL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Site structure backfilling to sub-grade elevations.
- B. Site filling and backfilling.
- C. Consolidation and compaction.
- D. Fill for over-excavation.

1.02 RELATED SECTIONS

- A. Section 312316 - Excavation.
- B. Section 312213 – Rough Grading.

1.03 REFERENCES

- A. ANSI/ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
- B. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. Rammer and 18-inch Drop.

1.04 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Test Reports: Submit sieve analysis for each type fill to be used.

PART 2 PRODUCTS

2.01 FILL MATERIALS

- A. Type A - Coarse Stone: Angular, washed natural stone; free of shale, clay, friable material, sand, debris; graded in accordance with ANSI/ASTM C136 within the following limits

Sieve Size	Percent Passing
2-inch	100%
1-inch	95%
3/4-inch	75 - 90%
5/8-inch	35 - 60%
3/8-inch	15 - 35%
No. 4	< 5%

CONTRACT No. 22-523
DIVISION 31 - EARTHWORK

- B. Type B – Pea Gravel: Natural stone; washed, free of clay, shale, organic matter; graded in accordance with ANSI/ASTM C136, to the following:
1. Minimum Size: ¼ inch.
 2. Maximum Size: 5/8 inch.
- C. Type C - Sand: Natural river or bank sand; washed, free of silt, clay, loam, friable or soluble materials, or organic matter; graded in accordance with ANSI/ASTM C136, within the following limits:
- | <u>Sieve Size</u> | <u>Percent Passing</u> |
|-------------------|------------------------|
| No. 4 | 100 |
| No. 14 | 10 - 100 |
| No. 50 | 5 - 90 |
| No. 100 | 4 - 30 |
| No. 200 | 0 - 1 |
- D. Type D - Subsoil: Reused, excavated material, graded, free of lumps, rocks and gravel larger than 3 inches in size, debris and contaminants; no more than 15% passing the No. 200 sieve.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions and substrate.
- B. Verify fill materials to be reused are acceptable.
- C. Verify items to be buried during backfilling process have been inspected prior to backfilling.

3.02 PREPARATION

- A. Compact subgrade to 95 percent maximum dry density in accordance with ANSI/ASTM D1557.
- B. Cut out soft areas of subgrade not capable of in situ compaction. Backfill with Type C fill and compact to density equal to or greater than requirements for subsequent backfill material.

3.03 BACKFILLING

- A. Backfill areas to contours and elevations with unfrozen materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy materials.
- C. Place and compact materials in continuous layers not exceeding 6 inches compacted density.
- D. All backfilled materials shall be compacted to 95 percent maximum dry density in accordance with ANSI/ASTM D1557. Maintain optimum moisture content to attain required density.

CONTRACT No. 22-523
DIVISION 31 - EARTHWORK

- E. Employ a placement method that does not disturb or damage structures or other items against which material is backfilled.
- F. Backfill against supported structures. Do not backfill against unsupported structures.
- G. Backfill simultaneously on each side of structure.
- H. Make grade changes gradual. Blend slope into level areas.
- I. Remove surplus backfill materials from site.
- J. Leave fill material stockpile areas completely free of excess fill materials.

3.04 TOLERANCES

- A. Maximum Variation From Top Surface of Backfilling Under Paved Areas: 1/4 inch.
- B. Maximum Variation From Top Surface of General Backfilling: 0.5 inch.

3.05 FIELD QUALITY CONTROL

- A. Perform field tests and analysis of fill material in accordance with ANSI/ASTM D1557.
- B. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to Owner.
- C. Unless additional testing is required by the Engineer, compaction tests shall be taken at the following rates:
 - 1. Pavement Subgrade: One test per 500 square feet of subgrade immediately prior to placing subbase.

END OF SECTION

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SECTION 31 23 24 - COMPACTION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Compaction requirements and test methods.
 - 2. Compaction of all subgrades, foundations, embankments, trench backfills, filled and backfilled material as specified.
- B. Related Sections
 - 1. Section 31 00 00 – Earthwork

1.2 REFERENCES

- 1. ASTM D698-Laboratory Compaction of Soil Using Standard Effort
- 2. ASTM D1556 – Density of Soil in Place by the Sand-Cone Method
- 3. ASTM D1557-Laboratory Compaction of Soil Using Modified Effort
- 4. ASTM D2922-Density of Soil in Place by Nuclear Methods
- 5. ASTM D3017-Water Content of Soil in Place by Nuclear Methods

1.3 SUBMITTAL

- A. Submit in writing a description of the equipment and methods proposed to be used for compaction.

1.4 QUALITY ASSURANCE

- A. The Contractor shall adopt compaction methods which will produce the degree of compaction specified herein, prevent subsequent settlement, and provide adequate support for the surface treatment, pavement, structure and piping to be placed thereon, or therein, without damage to the new or existing facilities.
- B. The natural subgrade for all footing, mats, slabs-on-grade for structures or pipes shall consist of firm undisturbed natural soil, at the grades shown on the Drawings.
- C. After excavation to subgrade is completed, the subgrade shall be compacted if it consists of loose granular soil or if its surface is disturbed by the teeth of excavating equipment.
 - 1. This compaction shall be limited to that required to compact loose surface material and shall be terminated in the event that it causes disturbance to underlying fine-grained soils, as revealed by weaving or deflection of the subgrade under the compaction equipment.
 - 2. If the subgrade soils consist of saturated fine or silty sands, silts, or clay or varved clays, no compaction shall be applied.

PART 2 PRODUCTS – Not Used

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine spaces to be filled beforehand and remove all unsuitable materials and debris including sheeting, forms, trash, stumps, plant life, etc.
- B. Inspect backfill and fill materials beforehand and remove all roots, vegetation, organic matter, or other foreign debris. Stones larger than 12 inches in any dimension shall also be removed or broken into smaller pieces.
- C. No backfill or fill material shall be placed on frozen ground nor shall the material itself be frozen or contain frozen soil fragments.
- D. Spaces to be filled shall be free from standing water so that placement and compaction of the fill materials can be accomplished in “dry” conditions.

3.2 PREPARATION

- A. Brace walls and slabs of structures to support surcharge loads and construction loads imposed by compaction operations.
- B. Proof-roll all subgrade surfaces to accept fill material.
- C. Each layer of fill shall be compacted to the specified density the same day it is placed.
 - 1. The moisture content of backfill or fill material shall be adjusted, if necessary to achieve the required degree of compaction.
- D. Compact each lift in accordance with Table 1.
- E. Match compaction equipment and methods to the material and location being compacted in order to obtain specified compaction, with consideration of the following guidelines:
 - 1. Rubber-tired rollers are preferred for most areas to prevent bridging of softer materials.
 - 2. Double smooth drum rollers may be used provided that careful inspection can prevent bridging.
 - 3. Compaction roller should be lighter in weight than proof-rolling equipment, with a minimum compaction force of 350 pounds per linear inch (PLI).
 - 4. Vibratory compaction is preferred for dry, granular materials.
 - 5. Hand compaction equipment such as impact rammers, plate or small drum vibrators, or pneumatic buttonhead compactors should be used in confined areas.
 - 6. Hydraulic compaction by pounding or jetting will not be permitted.
 - 7. Backhoe-mounted hydraulic or vibratory tampers are preferred for compaction of backfill in trenches under pavements over 4 feet in depth. The upper 4 feet shall be compacted as detailed above or with hand-guided or self propelled vibratory compactors or static roller.
 - 8. For plastic pipelines (PVC, PE or PB) do not compact directly over center of pipe until backfill has reached 2 feet above top of pipe.

TABLE 1
 COMPACTION REQUIREMENTS

CONSTRUCTION ELEMENT	MAXIMUM COMPACTION LAYER THICKNESS (INCHES)	ASTM	MINIMUM COMPACTION
I. STRUCTURES			
a. Fill beneath foundation elements and under slabs-on-grade - hand-guided compaction	6	D1557	95%
Fill beneath foundation elements and under slabs-on-grade - self-propelled or tractor-drawn compaction	8	D1557	95%
b. Fill around structures and above footings	8	D1557	95%
II. TRENCHES*			
a. Fill under pipelines and pipe bedding	12	D1557	95%
b. Pipe sidefills and top 4 feet of pipe backfill under pavements	8	D1557	95%
c. Backfill below 4 feet under pavement	8	D1557	95%
d. Backfill under lawns, gardens and cultivated fields	12	D1557	90%
e. All other trenches	12	D698	90%
III. EMBANKMENTS AND FILLS			
a. Fill under streets, parking lots, and other paved areas	12	D1557	95%
b. Embankments not supporting pavement or structures	12	D1557	90%
c. Rough site grading	12	D698	90%

*The first 1 foot above pipelines shall have a compacted thickness of 12 inches.

3.3 FIELD QUALITY CONTROL

A. Material Testing

1. Testing shall be done by a qualified, independent testing laboratory.
2. For each material which does not meet specifications, Contractor shall supply an equal quantity of acceptable material and required testing at no additional cost to the Owner.
3. The Contractor shall anticipate these tests and incorporate the time and effort into his procedures.
4. The Engineer reserves the right to order additional testing of materials at any time during the work.

B. Compaction Testing

1. Testing shall be conducted for every 200 cubic yards of fill or backfill, or every 75 linear feet of trench backfill placed.

2. Paved and Building Slab Areas - At subgrade and at each compacted fill and backfill layer, at least one test for every 2,000 square feet (186 sq. m) or less of paved area or building slab, but in no case fewer than three tests.
 3. Foundation Wall Backfill - At each compacted backfill layer, at least one test for each 100 feet (30 m) or less of wall length, but no fewer than two tests.
 4. The Contractor shall dig test holes and provide access to all backfill areas at no additional compensation when requested by the Engineer.
 5. For each material which does not meet specifications, Contractor shall supply an equal quantity of acceptable material and required testing at no additional compensation to the Owner.
 6. The Contractor shall anticipate these tests and incorporate the time and effort into his procedures.
 7. Nuclear moisture density testing by “probe” methods will be acceptable for compacted layers not exceeding 8 inches in thickness.
 - a. Nuclear “backscatter” methods will be acceptable only for testing asphalt paving layers not in excess of 3 inches in thickness.
 - b. Only certified personnel shall conduct nuclear testing.
 - c. If the nuclear method is utilized, the results shall be checked by at least one in-place density test method described above.
 8. The Engineer reserves the right to order the qualified independent testing laboratory to conduct additional in-place density tests of compacted lifts.
- C. Unacceptable Stockpiled Material - Stockpiled material may be tested according to Material Testing Materials.
- D. Alternate Methods of Compaction - The Contractor may employ alternate methods of compaction if the desired degree of compaction can be successfully demonstrated to the Engineer’s satisfaction.
- E. Select Material - On-Site - Any on-site material may be used for select fill material provided it meets all the requirements of the equivalent off-site material. No on-site material shall be used without prior approval of the Engineer. Reference Section 31 00 00.
- F. Systematic Compaction - Compaction shall be done systematically, and no consideration shall be given to incidental coverage due to construction vehicle traffic.

3.4 PROTECTION

- A. Prior to terminating work for the day, the final layer of compacted fill, after compaction, shall be rolled with a smooth-wheel roller if necessary to eliminate ridges of soil left by tractors or equipment used for compaction or installing the material.
- B. As backfill progresses, the surface shall be graded so as to drain off during incidence of rain such that no ponding of water shall occur on the surface of the fill.

CONTRACT No. 22-523
DIVISION 31 – EARTHWORK

- C. The Contractor shall not place a layer of fill on snow, ice or soil that was permitted to freeze prior to compaction.
 - 1. These unsatisfactory materials shall be removed prior to fill placement.

– END OF SECTION –

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SECTION 31 23 33 - TRENCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Excavate trenches for piping and utilities.
- B. Compacted bedding and backfill around and over piping and utilities to subgrade elevations.
- C. Backfilling and compaction.

1.02 RELATED SECTIONS

- A. Section 312213 – Rough Grading: Topsoil removal from site surface.

1.03 REFERENCES

- A. ANSI/ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
- B. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18-inch Drop.

1.04 SUBMITTALS

- A. Test Reports: Submit a sieve analysis for backfill to be used.

1.05 QUALITY ASSURANCE

- A. Do not excavate wet or frozen materials without written approval from the Engineer.
- B. Do not backfill over or with wet or frozen materials.
- C. Provide safety barricades around open excavations.

1.06 FIELD MEASUREMENTS

- A. Verify that survey benchmark and intended elevations for the work are as shown on plans.

1.07 COORDINATION

- A. Coordinate trenching with installation of pipe or conduit.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Subsoil: Reused, excavated material, graded, free of lumps, rocks and gravel larger than 3 inches in size, debris and contaminants.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing site conditions and substrate.
- B. Verify fill materials to be reused are acceptable.
- C. Verify items to be buried during backfilling process have been inspected prior to backfilling.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Maintain and protect existing utilities remaining which pass through work area.
- C. Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.
- D. Protect benchmarks, existing structures, fences, sidewalks, paving and curbs from excavation equipment and vehicular traffic. Any item damaged by the contractor shall be promptly repaired at the contractor's expense.
- E. Protect above and below grade utilities which are to remain.
- F. Cut out soft areas of subgrade not capable of in situ compaction. Backfill with subsoil fill and compact to density equal to or greater than requirements for subsequent backfill material.

3.03 EXCAVATION

- A. Excavate subsoil required for piping.
- B. Cut trenches to the dimensions shown on the plans.
- C. Excavation shall not interfere with normal 45 degree bearing splay of foundations.
- D. Hand trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.
- E. Remove lumped subsoil, boulders, and rock.
- F. For trenches made in solid rock, excavate to a depth of 1 foot below the proposed pipe invert.
- G. Correct unauthorized excavation at no cost to Owner in accordance with Section 31 23 23.13.
- H. Stockpile excavated material in area designated on site and remove excess material not being used from site. Remove excavated material from site.

3.04 BACKFILLING

- A. Support pipe and conduit during placement and compaction of fill material.
- B. For trenches made in solid rock, place an additional 1 foot of fill material under pipe or conduit.
- C. Place fill material to the dimensions and limits as shown on the plans.
- D. Compact fill material to 95 percent maximum dry density in accordance with ANSI/ASTM D1557. Maintain optimum moisture content to attain required density.
- E. Place fill material simultaneously on both sides of the pipe or conduit. Backfill to the dimensions and limits shown on the plans with reused subsoil.
- F. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- G. Place and compact material in continuous layers not exceeding 6 inches compacted depth.
- H. Employ a placement method that does not disturb or damage conduit or pipe.

3.05 TOLERANCES

- A. Maximum Variation From Top Surface of Backfilling Under Paved Areas: 1/4 inch.
- B. Maximum Variation From Top Surface of General Backfilling: 1 inch.

3.06 FIELD QUALITY CONTROL

- A. Perform field tests and analysis of fill material in accordance with ANSI/ASTM D1557.
- B. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to Owner.
- C. Unless additional testing is required by the Engineer, compaction tests shall be taken every 100 feet, at the springline of the pipe and every 2 vertical feet of backfill.

3.07 CLEANING

- A. Remove surplus backfill materials from site.
- B. Leave fill material stockpile areas completely free of excess fill materials.

3.08 PROTECTION

- A. Protect finished work.
- B. Recompact fills subjected to vehicular traffic.

END OF SECTION

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SECTION 31 41 00 - EXCAVATION PROTECTION SYSTEM

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Design, furnishing, installation and removal of excavation protection systems as necessary for the construction of the work.
 - 2. Design, furnishing, installation, maintenance and removal of shoring and underpinning for support of existing structures or structural elements, duct banks, pipes and utilities.
- B. Related Sections:
 - 1. Section 31 00 00 – Earthwork
 - 2. Section 31 19 13 – Geotechnical Instrumentation and Monitoring

1.2 REFERENCES

- A. General Requirements:
 - 1. Except as modified by governing codes and by this Specification, comply with the applicable provisions and recommendations of latest editions of the following.
 - 2. Where the language in any of the documents referred to herein is in the form of a recommendation or suggestion, such recommendations or suggestions shall be deemed to be mandatory under this Contract unless otherwise directed by the Engineer.
 - 3. Conflicts: Conform to requirements of cited standard unless specified otherwise. In case of apparent conflict between standards, or between standards and the specifications herein, the more stringent shall apply unless otherwise directed by the Engineer.
- B. New York State Department of Labor, Rule. No. 23 of the Industrial Code – “Protection in Construction, Demolition and Excavation Operations”.
- C. New York State Department of Transportation Standard Specifications
- D. Occupational Safety and Health Administration (OSHA).
- E. All other applicable Federal, State and Municipal codes, rules and regulations

1.3 SUBMITTALS

- A. Prior to the start of work, the Contractor shall submit design drawings and calculations signed and sealed by a Professional Engineer registered in the State of New York for:
 - 1. Proposed excavation protection systems.
 - 2. Proposed shoring and underpinning work

- B. Manufacturer's specification and other data for the components and elements to be furnished and installed under this section.
- C. Completed bill of materials showing all items to be furnished and installed under this Section
- D. Complete shop drawings of all work of this Section showing dimensions and locations of all items including supporting structures and clearance requirements.
- E. Proposed construction sequence, procedures and schedule including arrangement and method of assembly of the proposed the proposed excavation protection systems, and shoring and underpinning system. Provide procedures for preloading of systems, if applicable.
- F. Description of proposed equipment including data for gages and jack calibration certified by an accepted testing agency.
- G. Anticipated construction equipment loads.
- H. Building Condition Survey: Prepare a Building Condition Survey of all structures and facilities:
 - 1. Within 100 ft of pile driving operation.
 - 2. To be shored or underpinned.
- I. Vibration Monitoring Plan: Prepare a Vibration Monitoring Plan of all structures and facilities within 100 ft of pile driving operations.
- J. All structures and facilities to be shored or underpinned to establish existing elevations and horizontal location in relation to an approved remote permanent benchmark.
- K. Complete procedures for detection of vertical or horizontal movement in all structures, tanks and facilities to be shored or underpinned.

1.4 QUALITY ASSURANCE

- A. Throughout the process of the work of this Section, provide at least one person who shall be thoroughly familiar with the specified requirements, completely trained and experienced in the necessary skills and who shall be present at the site and direct the work performed under this Section.
- B. In the performance of the work of this Section, use an adequate number of trained workmen experienced in the use, installation and removal of Excavation Protection Systems and shoring and underpinning.
- C. The work of this Section shall be performed by a specialty subcontractor specializing in and having experience installing, maintaining and monitoring excavation protections systems, and shoring and underpinning systems in similar circumstances for at least five (5) years.

CONTRACT NO. 22-523
DIVISION 31 - EARTHWORK

- D. The Contractor may perform the work of this Section if he has experience conforming to the above requirements.
- E. The Contractor shall assume sole responsibility for the work of this Section and for loss or damage resulting from its partial or complete failure.
- F. The work of this Section shall be designed, installed and monitored under the direct supervision of a Professional engineer registered in the State of New York having experience in the design of this Work.

1.5 COORDINATION

- A. Coordinate the work of this Section with other sections of work and trades

PART 2 PRODUCTS

2.1 MATERIALS

- A. Materials for soldier pile and lagging walls shall conform to the requirements of Section 551 of NYSDOT Special Specifications.
- B. Materials for sheet piling shall conform to the requirements of Section 552-2 of NYSDOT Standard Specifications.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

- A. The Contractor shall exercise care throughout the progress of the work to avoid damage to the existing work remaining in place, and to adjacent structures, and in the event of any such damage, the Contractor shall replace or repair such affected work to the satisfaction of the Engineer and without additional cost to the Owner.
- B. The Contractor shall design, furnish place, maintain and remove the work of this Section as required by 29CFR1926 and New York State Department of Labor, Rule. No. 23 of the Industrial Code.
- C. Details of the work of this Section and its installation must conform with the requirements of 29CFR1926, New York State Department of Labor, Rule. No. 23 of the Industrial Code, and all Local, State and Federal Safety Codes.

3.2 EXCAVATION PROTECTION SYSTEM (EPS) REQUIREMENTS

- A. The EPS may consist of sheeting, shoring, a shield system, i.e. trench box, trench shield or other pre-engineered protective system to prevent cave-ins.

- B. The requirements of any EPS shall be as contained in 29CFR1926 and New York State Department of Labor, Rule. No. 23 of the Industrial Code.
- C. The EPS may be left in place only with the written permission of the Engineer.
- D. Where the EPS consists of soldier pile and lagging walls, the work shall be conducted in accordance with the requirements of Section 551 of NYSDOT Special Specifications.
- E. Where the EPS consists of sheet piles, the work shall be done in accordance with the requirements of Section 552-3 of NYSDOT Standard Specifications.
- F. The EPS shall be so designed that no elements are braced or blocked against, or otherwise supported by piping or conduits.
- G. Where proposed excavation protection systems consist of soldier piles and lagging walls:
 - 1. All wood elements shall be removed in conjunction with backfilling operations.
 - 2. When permitted to remain in place non-wood elements shall be cut-off a minimum of 3 feet below finished grade or as directed by the Engineer.
- H. Where proposed excavation protection systems consisting of steel sheeting are permitted to remain in place:
 - 1. Sheeting shall be cut-off a minimum of 3 feet below grade or as directed by the Engineer.
 - 2. 3-inch diameter holes spaced 36-inches on center horizontally and vertically shall be cut into all steel sheet piles left in place in conjunction with backfilling operations.

3.3 SHORING AND UNDERPINNING REQUIREMENTS

- A. Shoring and underpinning may be cast or included in permanent construction, if approved by the Engineer.
- B. Prior to the start of shoring and underpinning work, the Contractor shall establish a Structures Monitoring Program to providing vertical movement monitoring (settlement) and lateral movement monitoring (offset reading points) on the potentially affected structures or utilities and on elements of the shoring and underpinning system. Baseline readings shall be made three (3) days prior to the start of the work.
- C. The Contractor shall provide a contingency shoring plan or alternate procedures to be implemented if excessive movement, is evident. The Contractor shall keep on hand materials and equipment necessary to implement the contingency shoring and underpinning plan.
- D. The Contractor shall maintain shoring and underpinning until structural elements are rebraced and resupported and permanent construction is able to withstand all loads.
- E. When it is determined by the Contractor's Registered Professional Engineer that the shoring and underpinning is no longer required, the Contractor shall notify the Engineer a minimum of three (3) days prior to its removal.

CONTRACT NO. 22-523
DIVISION 31 - EARTHWORK

- F. Any damages to the structures shall be the sole responsibility of the Contractor and he shall bear the entire cost of correcting any such damage.

3.4 EXAMINATION

- A. Verify site conditions and note subsurface irregularities affecting Work of this section.

3.5 PREPARATION

- A. Identify required lines, levels, contours, and datum.

3.6 PROTECTION

- A. The Contractor shall protect the work of other trades, Contractors and Subcontractors from damage.
- B. The Contractor shall make provision for the protection of all existing and new structures, utilities, piping, equipment, and other objects that might be damaged in the course of the work of this Section.
- C. During the work of this Section, every precaution shall be taken to ensure the continuous safe operation of the wastewater treatment facility. No interruption will be permitted and only such changes in the normal operating procedure as are approved by the Engineer will be permitted.
- D. Care shall be taken to protect all utility lines, piping and conduit that are in the excavation area. The Contractor shall inform the Engineer of their location and notify the Engineer of any breaks immediately. In the event of break or other damage caused by excavation operations, the Contractor shall be responsible to either immediately repair the lines at his own cost, or arrange for the appropriate utility to make such repair at the Contractor's cost.

3.7 NOTIFICATION OF ENGINEER

- A. Notify the Engineer before commencing:
 1. EPS installation and removal
 2. Shoring and underpinning installation and removal.

3.8 VIBRATION MONITORING

- A. Conduct vibration monitoring of nearby structures slated to remain 100 ft of pile driving operation.

3.9 STRUCTURES MONITORING PROGRAM

- A. The monitoring program shall be prepared by a qualified Registered Professional Engineer licensed in the State of New York and shall bear his signature and seal.

CONTRACT NO. 22-523
DIVISION 31 - EARTHWORK

- B. The Contractor shall clearly identify benchmarks and record existing elevations. Datum level used to establish benchmark elevations shall be located in an area that will not be disturbed by movement resulting from shoring and underpinning operations.
- C. Devices for determining movements shall be firmly affixed and spaced as required to adequately detect any movement. Devices shall be checked daily during shoring and underpinning installation and at least weekly after installation is complete.
- D. The Contractor shall maintain a log of movement of monitoring readings for comparison with original recorded positions, and shall promptly notify the Engineer if movement occurs or if cracking or other damage is evident.

3.10 FIELD QUALITY CONTROL

- A. The Contractor shall designate a “Competent Person” 29 CFR 1926.32(f) who shall be responsible for inspections of excavations on a daily basis and document and maintain daily trenching and excavation logs per OSHA 29 CFR 1926.

- END OF SECTION -

SECTION 31 62 15 – DRILLED MICROPILES

PART 1 GENERAL

1.1 SUMMARY

- A. Work Specified:
 - 1. Micropile Foundation System: Micropiles which transfer the loads of the structural elements indicated on the Drawings to the underlying soils/ledgerock.
 - 2. Contractor shall engage a Professional Engineer licensed in New York State for the design and detailing of micropiles. Micropile layouts and quantities shall be based on the Contract Drawings.

- B. Related Sections:
 - 1. Section 03 30 00 – Concrete and Reinforcing Steel
 - 2. Section 03 60 00 – Grout
 - 3. Section 31 00 00 – Earthwork
 - 4. Section 05 50 00 – Metal Fabrications and Anchorage
 - 5. Section 05 12 00 – Structural Steel Framing

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM C33 – Standard Specification for Concrete Aggregates.
 - 2. ASTM C40 – Test Method for Organic Impurities in Fine Aggregates for Concrete.
 - 3. ASTM C109 – Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-inch or 50 mm Cube Specimens)
 - 4. ASTM C150 – Standard Specification for Portland Cement.
 - 5. ASTM C191 – Test Method for Time of Setting of Hydraulic Cement by Vicat Needle.
 - 6. ASTM C307 – Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing.
 - 7. ASTM C531 – Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
 - 8. ASTM C579 – Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts, monolithic Surfacing and Polymer Concretes.
 - 9. ASTM C827 – Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.
 - 10. ASTM C939 – Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow cone Method).
 - 11. ASTM C1107 – Packaged Dry, Hydraulic Cement Grout (Non-Shrink)

- B. American Concrete Institute:
 - 1. ACI 301 – Specifications for Structural Concrete.
 - 2. ACI 318 – Building Code Requirements for Structural Concrete.

3. ACI 305.1-06 – Standard Specifications for Hot Weather Concreting
4. ACI 305 – Hot Weather Concreting.
5. ACI 306.1 – Standard Specification for Cold Weather Concreting
6. ACI 306R-88 – Cold Weather Concreting

1.3 SUBMITTALS

A. Shop Drawings

1. Drawings to demonstrate compliance of augering, mixing, and pumping equipment, and installation of piles.
2. Drawings shall include erection details and reinforcement.
3. A complete and accurate record of all micropiles (both test and production piles). The record shall indicate the pile location, diameter, length, elevation of tip and top of pile, and the quantity and strength of grout material actually pumped in each micropile. Any unusual conditions encountered during pile installation shall be reported immediately to the Engineer.
4. Product Data: Grout, Materials, Grout Specimens for Laboratory Tests, Grout specimens for Contractor Tests, A description of the materials to be used and the proposed methods of operations.
5. Submit complete design calculations and working drawings to the Engineer for review and approval. Include all details, dimensions, quantities, ground profiles, and cross-sections necessary to construct the micropile structure. Verify the limits of the micropile structure and ground survey data before preparing the detailed working drawings. The drawings and calculations shall be signed and sealed by a Professional Engineer registered in the State of New York.
 - a. Design of piles shall be based on historical boring information provided in Appendix A. Contractor may elect to perform additional borings as required to complete the design of the micropiles. Additional borings shall be deemed included in the Contractor's bid.
6. Design Calculations shall be submitted including the following items:
 - a. A written summary report which describes the overall micropile design.
 - b. Applicable code requirements and design references.
 - c. Micropile structure critical design cross-section(s) geometry including soil/rock strata and piezometric levels and location, magnitude and direction of design applied loading, including slope or external surcharge loads.
 - d. Design criteria including, soil/rock shear strengths (friction angle and cohesion), unit weights, and ground-grout bond values and micropile drillhole diameter assumptions for each soil/rock strata.
 - e. Factors of safety and allowable stresses used in the design on the ground-grout bond values, surcharges, soil/rock and material unit weights, steel, grout, and concrete materials.

B. Prior to Installation

1. Location Plan and Shop Drawings
 - a. Identify each pile by number and station
 - b. Dimensions to control points established by the Engineer
 - c. Cut off elevations

- d. Method, sequence and schedule of installation
 - e. Splicing details
 - f. Mix design
 - 2. Equipment
 - a. Amount and character of all equipment
 - b. Manufacturer's literature
 - 3. Load Test
 - a. Method and procedure for load testing.
 - b. Applicable data listed in ASTM D1143, report.
 - c. Remarks about unusual circumstances or occurrences during the load test.
- C. During and After Installation
- 1. Installation Records
 - a. Pile installation records shall be maintained by a geotechnical engineer engaged by the Contractor. The Contractor shall provide all necessary facilities for inspection and shall cooperate with the Engineer in inspection and recording of the pile data at all times.
 - b. The Contractor shall prepare drawings giving an identification number for each pile and submit these drawings for approval before pile installation.
 - c. After completion of pile installation, the Contractor shall provide a survey showing the actual locations of the pile butts at cutoff elevations. Abandoned piles and their replacements shall also be shown on this survey. At a minimum the records shall include the following:
 - i. Date
 - ii. Identification number and structure
 - iii. Type of auger used
 - iv. Tip elevation
 - v. Cut-off elevation
 - vi. Location of splice
 - vii. Location of obstruction if encountered
 - viii. Deviation from tolerances
 - 2. Surveys
 - a. Records of pile elevation changes (heaving) and lateral movement.
 - b. Plan showing actual:
 - i. Date
 - ii. Pile location
 - iii. Pile orientations
 - iv. Tip elevations
 - v. Cut off elevations
 - vi. Abandoned pile locations
- D. Quality Control Submittals:
- 1. Qualifications Data: Name and address of the firm proposed to perform the Work of this Section. Include such qualifying information as necessary to verify that the firm meets the requirements specified under Quality Assurance Article.
 - 2. Design and Construction Information: Include design calculations for each pile capacity and specifications of materials intended for use.

3. Installation Sequence: Include details of the installation sequence and equipment to be used for the micropile construction, including load testing. The grouting shall be performed in accordance with the PTI (Post Tensioning Institute) “Recommended Practice for Grouting of Post Tensioned Prestressed Concrete” as applicable. Installation equipment shall be capable of drilling the micropile hole of the required minimum diameter to the required depth and maintaining the micropile hole open and clear until designated steel reinforcing has been inserted and the required minimum volume of grout has been placed. This submittal will not relieve the Contractor of responsibility for the successful performance of the micropile foundation system.

1.4 QUALITY ASSURANCE

- A. Designer’s and Installer’s Qualifications: The firm that performs the Work of this Section shall have a minimum of 5 years experience in the type of design and construction required for the Work of this Section and shall have designed and installed foundation systems for at least 5 projects of equivalent or greater difficulty as required by this Contract.
 1. The firm’s staff shall include at least one Professional Engineer licensed by New York State.
 2. The firm’s supervising engineer and site foreman or superintendent for this project shall have at least 5 years of experience in this type of foundation Work.

1.5 DESIGN REQUIREMENTS

- A. The drilled micropile shall be designed by a Professional Engineer registered in New York State and be in conformance with the requirements specified and the layouts/quantities shown on the Drawings.
- B. Design Criteria: Transfer the dead loads and live loads based on the Drawings through the drilled micropile to the underlying soils/ledgerock at the elevations indicated on the Drawings.
- C. At a minimum, all piles shall be 9.625” diameter with 0.50” wall thickness and an allowable axial capacity of 30-tons.

PART 2 PRODUCTS

2.1 GENERAL

- A. Materials shall comply with these Specifications and any applicable State or local requirements.

2.1 MATERIALS

- A. Furnish the materials required for the Work of this Section.

- B. Steel pipe in conformance with ASTM A252 Grade 2 or approved equal. Splicing of steel pipe shall be by threaded and coupled connections, or continuous butt welds.
- C. Reinforcing bar shall conform to the requirements of Section 03 30 00. Splicing shall be either full lap splices or approved couplers.
- D. Grout shall consist of Type I or III Portland Cement and water mix with a minimum 28-day compressive strength of 3,000 psi. Potable water shall be used for mixing grout.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Micropiles may be drilled by rotary or rotary percussive drilling equipment. Coring bits, roller bits, drag bids and/or down the hole hammers (DTH) may be utilized to advance the micropile hole through overburden soils, fill, or obstructions, etc. the required depth. Flush joint threaded drill casing shall be continuously placed to the required depth to prevent the collapse of the micropile hole.
- B. Drill cuttings shall be eliminated by wash water or other means which will not appreciably alter soil stability or aggravate existing environmental conditions. All debris from the drilling operations shall be removed by the Contractor.
- C. Prior to installing the approved reinforcing and grout placement, the micropile hole shall be flushed with clean water to remove all contaminated water and cuttings.
- D. The approved reinforcing steel shall be inserted for the depth of the micropile hole not more than 48 hours prior to grouting.
- E. If required, splicing of reinforcing shall provide for compressive and flexural strength at least equal to that of the reinforcing.
- F. Grout placement into the micropile hole shall be accomplished by tremie method. A tremie pipe of suitable diameter shall be inserted to the bottom of the micropile hole. Water shall be pumped at a high velocity through the tremie pipe until the wash water at the top of the casing is clear. The micropile hole shall be grouted immediately thereafter.
- G. The approved grout mix shall be pumped through the tremie pipe to the bottom of the micropile hole. Pumping shall continue until all water is displaced and the basing is full to the top of the micropile hole with a homogeneous grout mix. The tremie pipe shall be gradually lifted as the cement is being pumped to facilitate the upward flow of the grout. The end of the tremie pipe shall always be embedded at least five feet into the rising grout within the cased hole. Once the casing is overflowing with grout the tremie pipe shall be fully removed.

- H. The flush joint casings shall be gradually extracted from the micropile hole. A positive flow of grout into the micropile hole shall be maintained at all times when the casing is being withdrawn. Blockage inside the casing must be prevented in order to maintain a positive flow of grout into the micropile hole. The flow of grout shall be equal to or greater than the column represented by the outside diameter of the casing multiplied by the length of the casing withdrawn.
- I. The concrete grout in the casing shall be pressurized either continuously or periodically as the casing is extracted. The micropile contractor elects to use periodic pressurization, no more than five feet of casing shall be withdrawn between applications of pressure.
- J. Application of pressure to the micropile grout may be accomplished by either pneumatic or specific injection. The amount of pressure applied shall be such that the resulting micropile diameter meets the design requirements and pile bond values are enhanced without causing detrimental side effects.
- K. As the grout column drops in the casing during withdrawal and pressurization, additional grout shall be added to raise the grout level to the top of the casing.
- L. The grouting of the pile shall continue uninterrupted and shall be completed within a time frame not to exceed the initial setting time of the mixture.
- M. Tolerances:
 - 1. Variation from Vertical: 2 degrees maximum.
 - 2. Center of Top of Pile: Within 2 inches of design position.

3.2 FIELD QUALITY CONTROL

- A. Load Testing Piles: Test piles in accordance with ASTM D 1143, Quick Load Test Method for Individual Piles with the following modifications:
 - 1. Do not start a load test until the earth is removed to the elevation of the bottom of the pile cap.
 - 2. Notify the Director's Representative 5 working days prior to start of a load test.
 - 3. Perform a load test on one pile in each pile cap group indicated on the Drawings to be load tested.
 - 4. Apply load in 10-15 percent increments at 2.5 minute intervals to 200 percent of the allowable design load.
 - 5. Hold full test load for a period of one hour.
 - 6. Remove full test load in four 25 percent decrements at 5.0 minute intervals.
 - 7. The net settlement after rebound shall not exceed 0.50 inch.
 - 8. Test piles, if properly located and not exceeding 0.50 inch net settlement, are acceptable as permanent and may be left in place.
 - 9. Submit one copy of load test results, stamped by a New York State licensed professional engineer, to the Director's Representative.
- B. The following load tests, with exact locations to be determined by the Engineer, shall be deemed included in the Contractor's bid:
 - 1. Cross Axis Building F: 1 axial load test,

CONTRACT No. 22-523
DIVISION 31 – EARTHWORK

2. Dragon Coaster Vendors: 1 axial load test at Tower 7,
3. Restaurant Kitchen with Food Vending: 1 axial load test,
4. Southeast Arcade: 1 axial load test,
5. Northeast Burger Barn: 1 axial load test,

- END OF SECTION -

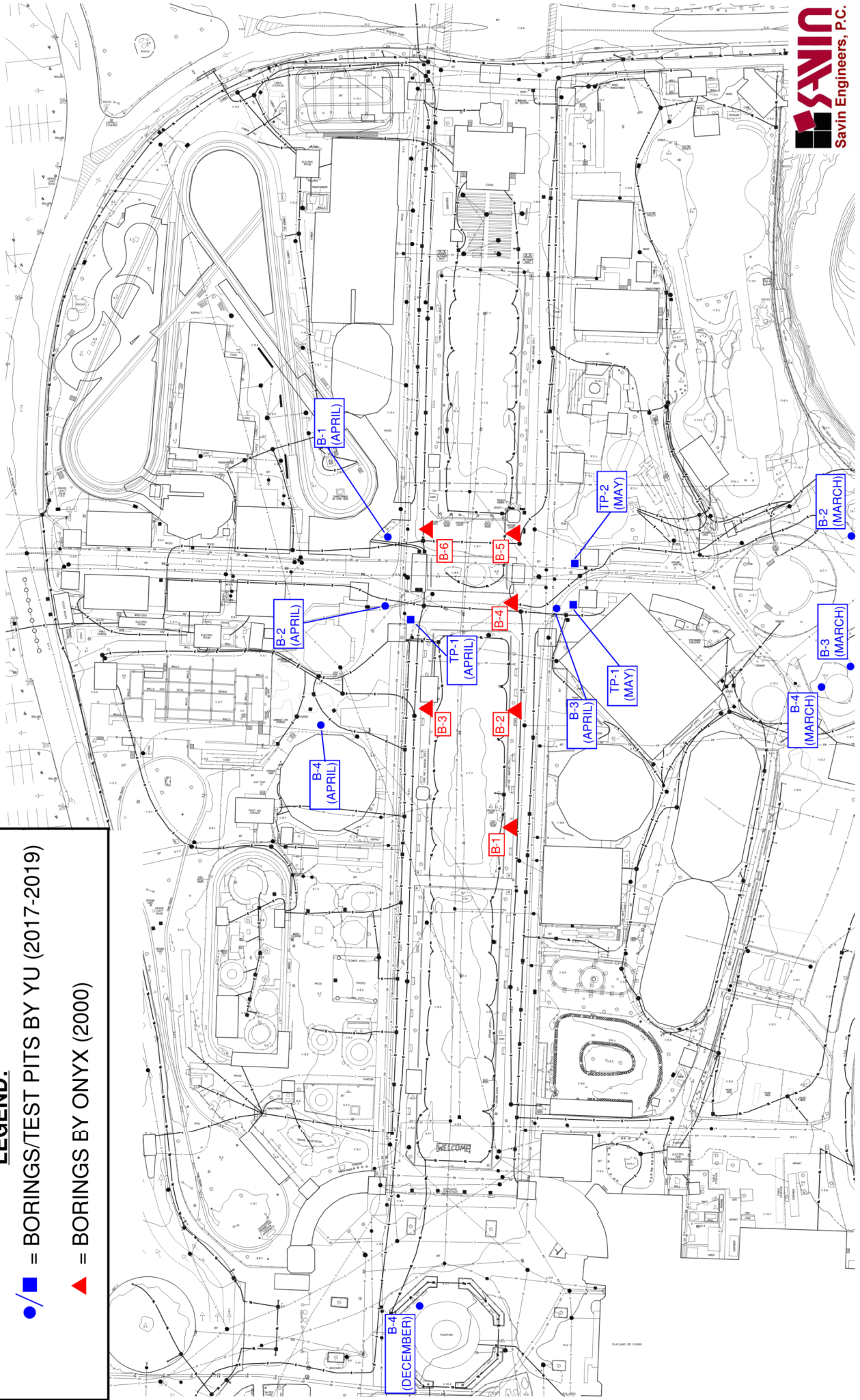
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CONTRACT 20-530

SPECIFICATION 31 62 15 - DRILLED MICROPILES

APPENDIX A - HISTORICAL BORING INFORMATION

LEGEND:
●/■ = BORINGS/TEST PITS BY YU (2017-2019)
▲ = BORINGS BY ONYX (2000)





& Associates

BORING LOG

BORING NUMBER: **B-1**

SHEET NUMBER: 1 of 1

PROJECT NUMBER: **16169**

PROJECT: **Playland Rehabilitation and Upgrades**
 PROJECT LOCATION: **1 Playland Parkway Rye, NY**
 CLIENT: **The LiRo Group**
 CONTRACTOR: **ADT**

LOCATION:
 COORD. **Not Surveyed**
 SURFACE ELEV.: **13.0 feet**
 surveyed
 estimated from: **USGS National Map**

DRILLER: **D. Gopaul**
 INSPECTOR: **W. Gonzalez**

DATUM: **NAVD 88**

DRILLING METHOD: **Mud Rotary**
 RIG TYPE: **Truck Mounted CME-75**

START DATE: **4/10/17** TIME: **10:30 am**
 FINISH DATE: **4/10/17** TIME: **12:30 am**

Type/Symbol	Casing	Split Spoon	Shelby Tube	Piston	Grab	Core Barrel
I.D.	NW	S <input checked="" type="checkbox"/>	U <input type="checkbox"/>	P <input type="checkbox"/>	G <input checked="" type="checkbox"/>	C <input type="checkbox"/>
O.D.	4"	1.375"				2"
Length	4.5"	2"				3"
Hammer Wt.	5"	24"				5'
Hammer Fall	140 lbs	140 lbs lbs	Hammer Type	Drill Rod Size (OD)		
	30"	30"	Automatic	2.625"		

Backfill Type: **Soil cuttings and asphalt**
 Observation Well Installed YES NO
 Estimated Groundwater Level 7
 Based On Soil Moisture
 Mud Level
 Observation Well Reading

NOTES: _____

DEPTH (feet)	GRAPHIC LOG	SAMPLE			SPT (Blows/6 in.)					FIELD CLASSIFICATION AND REMARKS		
		CASING (Blows/ft) CORING (Min./ft)	TYPE	NUMBER	SYMBOL	DEPTH (feet)	0"-6"	6"-12"	12"-18"		18"-24"	REC. (in.)
							CORING					
							RUN (in.)	REC (in.)	REC (%)		L>4 (in.)	RQD (%)
0.7											4" Asphalt, 4" Subbase.	12.3
5	PUSH PUSH PUSH PUSH PUSH										Grey CLAY, trace fine Sand, moist, (CH). (Hand excavated to 5' for utility clearance). Top: Grey CLAY, trace fine Sand, frequent roots, pp = 0.25 tsf, moist, (CH). Bottom: Dark Grey CLAY, little fine Gravel, little fine Sand, moist, (CL).	
8.0		S 1	5.0 - 7.0	WOH	WOH	5	6	20			Top: Grey CLAY, trace fine Sand, moist, (CL). Bottom: Grey/Brown, m-f SAND, little fine Gravel, little Silt, wet, (SM).	5.0
10		S 2	7.0 - 8.7	4	8	27	50/2"	19				
15		S 3	10.0 - 10.9	53	72/5"			13				
14.0												
19.0		C 1	14.0 - 19.0	60	58	97	42	70			Grey, GNEISS, slightly to moderately weathered, moderate strong rock, very thinly foliated, very close to medium close fracture spacing.	-6.0
											End of Boring at 19 feet	

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BORING LOG

BORING NUMBER: **B-2**
 SHEET NUMBER: 1 of 1
 PROJECT NUMBER: **16169**

PROJECT: **Playland Rehabilitation and Upgrades**
 PROJECT LOCATION: **1 Playland Parkway Rye, NY**
 CLIENT: **The LiRo Group**
 CONTRACTOR: **ADT**

LOCATION:
 COORD. **Not Surveyed**
 SURFACE ELEV.: **13.0 feet**
 surveyed
 estimated from: **USGS National Map**
 DATUM: **NAVD 88**

DRILLER: **D. Gopaul**
 INSPECTOR: **W. Gonzalez**
 DRILLING METHOD: **Mud Rotary**
 RIG TYPE: **Truck Mounted CME-75**

START DATE: **4/10/17** TIME: **1:26 pm**
 FINISH DATE: **4/11/17** TIME: **8:40 am**

Type/Symbol	Casing	Split Spoon	Shelby Tube	Piston	Grab	Core Barrel
I.D.	NW	S <input checked="" type="checkbox"/>	U <input type="checkbox"/>	P <input checked="" type="checkbox"/>	G <input checked="" type="checkbox"/>	C <input type="checkbox"/>
O.D.	4.0"	1.375"				2"
Length	4.5"	2"				3"
Hammer Wt.	10"	24"				5'
Hammer Fall	140 lbs	140 lbs	Hammer Type		Drill Rod Size (OD)	
	30"	30"			2.625"	

Backfill Type: Soil cuttings and asphalt
 Observation Well Installed YES NO
 Estimated Groundwater Level: 9
 Based On Soil Moisture
 Mud Level
 Observation Well Reading

NOTES: _____

DEPTH (feet)	GRAPHIC LOG	CASING (Blows/ft) CORING (Min./ft)	SAMPLE				SPT (Blows/6 in.)				
			TYPE	NUMBER	SYMBOL	DEPTH (feet)	0'-6"	6'-12"	12'-18"	18'-24"	REC. (in.)
							RUN (in.)	REC (in.)	REC (%)	L>4 (in.)	RQD (%)
5		PUSH	S 1		1.0 - 3.0	7	6	5	4	14	
		PUSH	S 2		3.0 - 5.0	4	5	5	4	17	
		PUSH	S 3		5.0 - 7.0	5	WOH	2	3	4	
		PUSH	S 4		7.0 - 9.0	1	WOH	2	5	9	
10		20	S 5		9.0 - 10.6	8	11	12	42/1"	14	
		4									
		4									
15		4	C 1		11.5 - 16.5	60	56.5	94	35.5	59	
		4									

FIELD CLASSIFICATION AND REMARKS

0.3 4" Asphalt. 12.7

Brown, c-m-f SAND, little Silt, trace fine Gravel, moist, (SM), (FILL).

Brown/Grey, c-m-f SAND, some Silt, trace fine Gravel, moist, (SM), (FILL).

5.0 8.0

Black, c-m-f SAND, and Silt & Clay, little fine Gravel, wet, (SM).

Black, m-f SAND, some Silt, little Gravel, trace organics, occasionally shell fragment, wet, (SM).

BLACK, m-f SAND, some Gravel, some Silt, wet, (SM).

11.5 1.5

Grey, GNEEISS, slightly to highly weathered, moderately strong, very closely to medium fractured.

16.5 -3.5

End of Boring at 16.5 feet

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BORING LOG

BORING NUMBER: **B-3**

SHEET NUMBER: 1 of 2

PROJECT NUMBER: **16169**

PROJECT: **Playland Rehabilitation and Upgrades**
 PROJECT LOCATION: **1 Playland Parkway Rye, NY**
 CLIENT: **The LiRo Group**
 CONTRACTOR: **ADT**

LOCATION:
 COORD. **Not Surveyed**
 SURFACE ELEV.: **13.0 feet**
 surveyed
 estimated from: **USGS National Map**

DRILLER: **D. Gopaul**
 INSPECTOR: **W. Gonzalez**

DATUM: **NAVD 88**
 START DATE: **4/11/17** TIME: **1:07 pm**
 FINISH DATE: **4/12/17** TIME: **9:50 am**

DRILLING METHOD: **Mud Rotary**
 RIG TYPE: **Truck Mounted CME-75**

Type/Symbol	Casing	Split Spoon	Shelby Tube	Piston	Grab	Core Barrel
I.D.	NW	S <input checked="" type="checkbox"/>	U <input type="checkbox"/>	P <input type="checkbox"/>	G <input checked="" type="checkbox"/>	C <input type="checkbox"/>
O.D.	4.0"	1.375"				2"
Length	4.5"	2"				3"
Hammer Wt.	140 lbs	140 lbs	Hammer Type		Drill Rod Size (OD)	
Hammer Fall	30"	30"			2.625"	

Backfill Type: Soil cuttings and asphalt
 Observation Well Installed YES NO
 Estimated Groundwater Level 7
 Based On Soil Moisture
 Mud Level
 Observation Well Reading

NOTES: _____

DEPTH (feet)	GRAPHIC LOG	CASING (Blows/ft) CORING (Min./ft)	SAMPLE			SPT (Blows/6 in.)					FIELD CLASSIFICATION AND REMARKS	
			TYPE	NUMBER	SYMBOL	DEPTH (feet)	0'-6"	6'-12"	12'-18"	18'-24"		REC. (in.)
							CORING					
							RUN (in.)	REC (in.)	REC (%)	L>4 (in.)		RQD (%)
											Depth	Elev.
											0.3	12.7
5											5.0	8.0
											5.8	7.2
10												
15												

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BORING LOG

(continued)

BORING NUMBER: B-3

SHEET NUMBER: 2 of 2

PROJECT NUMBER: 16169

PROJECT: Playland Rehabilitation and Upgrades

LOCATION: 1 Playland Parkway Rye, NY

CLIENT: The LiRo Group

CONTRACTOR: ADT

DRILLER: D. Gopaul

INSPECTOR: W. Gonzalez

DEPTH (feet)	GRAPHIC LOG	CASING (Blows/ft) CORING (Min./ft)	SAMPLE			SPT (Blows/6 in.)					FIELD CLASSIFICATION AND REMARKS	
			TYPE	NUMBER	SYMBOL	DEPTH (feet)	0"-6"	6"-12"	12"-18"	18"-24"		REC. (in.)
							CORING					
							RUN (in.)	REC (in.)	REC (%)	L>4 (in.)		RQD (%)
25		4.5 4 4 4.5 5	S C	7 1	20.0 - 20.1 21.0 - 26.0	39/1	60	60	100	47	78	Depth: 21.0 Elev.: -8.0 Grey, m-f SAND, little c-f Gravel, little Silt, decomposed rock fragment, wet, (SM). Grey, GNEISS, moderately to highly weathered, moderately strong to moderately weak, intensely foliated, very closely to medium fractured. Depth: 26.0 Elev.: -13.0 End of Boring at 26 feet
30												
35												
40												
45												

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BORING LOG

BORING NUMBER: **B-4**
 SHEET NUMBER: 1 of 2
 PROJECT NUMBER: **16169**

PROJECT: **Playland Rehabilitation and Upgrades**
 PROJECT LOCATION: **1 Playland Parkway Rye, NY**
 CLIENT: **The LiRo Group**
 CONTRACTOR: **ADT**
 DRILLER: **D. Gopaul**
 INSPECTOR: **W. Gonzalez**
 DRILLING METHOD: **Mud Rotary**
 RIG TYPE: **Truck Mounted CME-75**

LOCATION:
 COORD. **Not Surveyed**
 SURFACE ELEV.: **13.0 feet**
 surveyed
 estimated from: **USGS National Map**
 DATUM: **NAVD 88**
 START DATE: **4/11/17** TIME: **9:15 am**
 FINISH DATE: **4/11/17** TIME: **12:37 pm**

Type/Symbol	Casing	Split Spoon	Shelby Tube	Piston	Grab	Core Barrel	Backfill Type: Soil cuttings and asphalt
I.D.	NW	S <input checked="" type="checkbox"/>	U <input type="checkbox"/>	P <input type="checkbox"/>	G <input checked="" type="checkbox"/>	C <input type="checkbox"/>	Observation Well Installed <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
O.D.	4.0"	1.375"				2"	Estimated Groundwater Level <u>7</u>
Length	4.5"	2"				3"	Based On <input checked="" type="checkbox"/> Soil Moisture
Hammer Wt.	10"	24"				5'	<input type="checkbox"/> Mud Level
Hammer Fall	140 lbs	140 lbs	Hammer Type	Drill Rod Size (OD)			<input type="checkbox"/> Observation Well Reading
	30"	30"		2.625"			NOTES:

DEPTH (feet)	GRAPHIC LOG	CASING (Blows/ft) CORING (Min./ft)	SAMPLE		SPT (Blows/6 in.)					FIELD CLASSIFICATION AND REMARKS		
			TYPE	NUMBER	SYMBOL	DEPTH (feet)	0'-6"	6'-12"	12'-18"		18'-24"	REC. (in.)
							RUN (in.)	REC (in.)	REC (%)		L ₄ (in.)	RQD (%)
											Depth <u>0.3</u> Elev. <u>18.7</u> 4" Asphalt.	
											Grey, c-f GRAVEL, some c-f Sand, trace Silt, dry, (GM), (FILL). 3.0 Elev. <u>16.0</u>	
5											Brown, CLAY&SILT, some c-f Sand, little c-f Gravel, moist, (CL). Top: Grey, CLAY & SILT, some fine Sand, trace Gravel, trace organics, moist, (CL). Bottom: Grey, m-f SAND, some Silt, frequent peat fiber, occasional shell fragment, wet, (SM). Grey, CLAY, trace fine Sand, frequent peat fiber, trace organics, wet, (CL). 9.0 Elev. <u>10.0</u>	
											Grey, c-f SAND, and Silt, little c-f Gravel, occasional organic fiber, wet, (SM). 15.2 Elev. <u>3.8</u>	
15											Brown, m-f SAND, little Silt, decomposed rock, wet, (SM). Grey, GNEISS, slightly to highly weathered, moderately strong, very intensely foliated, very closely to medium closely fractured Soil seam at 18'.	

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BORING LOG

(continued)

BORING NUMBER: B-4

SHEET NUMBER: 2 of 2

PROJECT NUMBER: 16169

PROJECT: Playland Rehabilitation and Upgrades

LOCATION: 1 Playland Parkway Rye, NY

CLIENT: The LiRo Group

CONTRACTOR: ADT

DRILLER: D. Gopaul

INSPECTOR: W. Gonzalez

DEPTH (feet)	GRAPHIC LOG	CASING (Blows/ft) CORING (Min./ft)	SAMPLE			SPT (Blows/6 in.)					FIELD CLASSIFICATION AND REMARKS	
			TYPE	NUMBER	SYMBOL	DEPTH (feet)	0"-6"	6"-12"	12"-18"	18"-24"		REC. (in.)
							CORING					
							RUN (in.)	REC (in.)	REC (%)	L>4 (in.)		RQD (%)
											Depth	Elev.
											20.2	-1.2
25												
30												
35												
40												
45												
											End of Boring at 20.2 feet	

YU BORING LOG-SCA 16169 PROJECT.GPJ 16169 LIBRARY.GLB 4/25/17



BORING LOG

& Associates

BORING NUMBER: **B-5**

SHEET NUMBER: 1 of 1

PROJECT NUMBER: **16169**

PROJECT: **Playland Rehabilitation and Upgrades**
 PROJECT LOCATION: **1 Playland Parkway Rye, NY**
 CLIENT: **The LiRo Group**
 CONTRACTOR: **ADT**

LOCATION:
 COORD. **Not Surveyed**
 SURFACE ELEV.: **14.0 feet**
 surveyed
 estimated from: **USGS National Map**

DRILLER: **D. Gopaul**
 INSPECTOR: **W. Gonzalez**

DATUM: **NAVD 88**
 START DATE: **4/12/17** TIME: **10:20 am**
 FINISH DATE: **4/12/17** TIME: **2:11 pm**

DRILLING METHOD: **Mud Rotary**
 RIG TYPE: **Truck Mounted CME-75**

Type/Symbol	Casing	Split Spoon	Shelby Tube	Piston	Grab	Core Barrel
I.D.	NW	S <input checked="" type="checkbox"/>	U <input type="checkbox"/>	P <input type="checkbox"/>	G <input checked="" type="checkbox"/>	C <input type="checkbox"/>
O.D.	4.0"	1.375"				2"
Length	4.5"	2"				3"
Hammer Wt.	10"	24"				5'
Hammer Fall	140 lbs	140 lbs	Hammer Type		Drill Rod Size (OD)	
	30"	30"			2.625"	

Backfill Type: Soil cuttings and asphalt
 Observation Well Installed YES NO
 Estimated Groundwater Level 7
 Based On Soil Moisture
 Mud Level
 Observation Well Reading

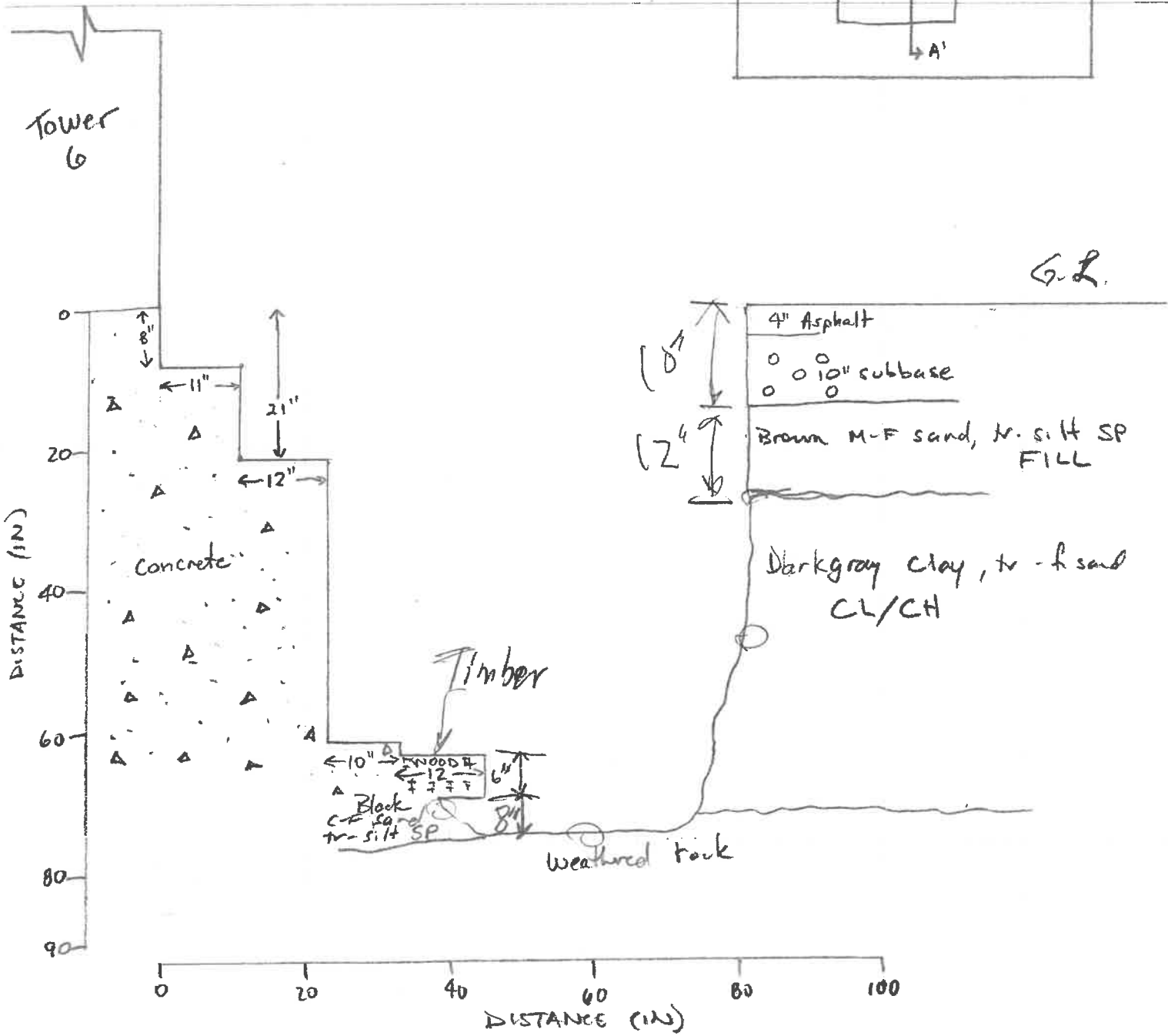
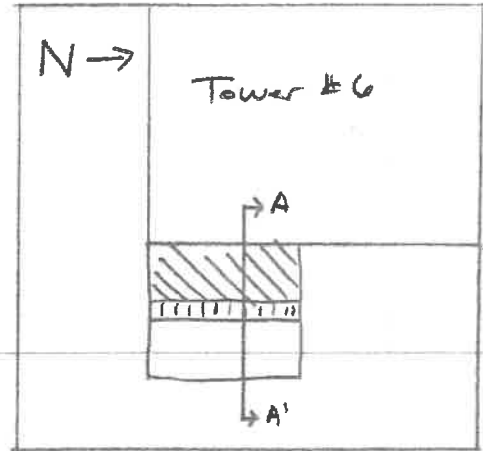
NOTES: _____

DEPTH (feet)	GRAPHIC LOG	CASING (Blows/ft) CORING (Min./ft)	SAMPLE			SPT (Blows/6 in.)					FIELD CLASSIFICATION AND REMARKS	
			TYPE	NUMBER	SYMBOL	DEPTH (feet)	0"-6"	6"-12"	12"-18"	18"-24"		REC. (in.)
							CORING					
							RUN (in.)	REC (in.)	REC (%)	L _v 4 (in.)		RQD (%)
0.3										4" Asphalt.	13.7	
1.0 - 2.0		PUSH	G 1	X						12	Brown, c-f GRAVEL, some c-f Sand, little Silt, dry, (FILL). (Hand excavated to 2' for utility clearance).	
2.0 - 4.0		PUSH	S 1	X	4	4	3	5		11	Brown, c-f SAND, some c-f Gravel, little Silt, dry, (SM), (FILL).	
5.0 - 7.0		PUSH	S 2	X	5	7	5	4		15	Brown, c-f SAND, some Silt, trace fine Gravel, wet, (SM), (FILL).	
7.0 - 8.7		PUSH	S 3	X	17	46	29	21/2"		19	Brown, c-f SAND and c-f Gravel, little Silt, decomposed rock, wet, (SM).	7.0
9.0 - 9.8		PUSH	S 4	X	26	30/3"				7	Brown, c-f SAND, and c-f Gravel, little Silt, decomposed rock, wet, (SM).	11.0
11.0 - 16.0			C 1		60	59	98	32.5		53	Grey, GNEISS, moderately to highly weathered, moderately strong, very intensely foliated, very closely to medium fractured.	3.0
16.0											End of Boring at 16 feet	-2.0

YU BORING LOG-SCA 16169 PROJECT.GPJ 16169 LIBRARY.GLB 4/25/17

TP-1

TEST PIT A'-A





& Associates

BORING LOG

BORING NUMBER: **B-4**

SHEET NUMBER: 1 of 2

PROJECT NUMBER: **17264**

PROJECT: **Playland Rehabilitation and Upgrades**

LOCATION: **1 Playland Pkwy, Rye, NY 10580**

CLIENT: **The Liro Group**

CONTRACTOR: **Warren George, Inc. (WGI)**

DRILLER: **E. Cardona**

INSPECTOR: **M. Policastro**

DRILLING METHOD: **Rotary Wash**

RIG TYPE: **Dietrech D50**

LOCATION: **See Plan**

COORD. **Not Surveyed**

SURFACE ELEV.: **14.0± feet**

surveyed

estimated

DATUM: **NAVD88**

START DATE: **12/8/17** TIME: **11:30 pm**

FINISH DATE: **12/8/17** TIME: **2:00 pm**

Type/Symbol	Casing	Split Spoon	Shelby Tube	Piston	Grab	Core Barrel
I.D.	HW	S <input checked="" type="checkbox"/>	U <input type="checkbox"/>	P <input type="checkbox"/>	G <input checked="" type="checkbox"/>	C <input type="checkbox"/>
O.D.	4.0"	1.375"				2.16"
Length	4.5"	2"				2.96"
Hammer Wt.	5'	24"				5'
Hammer Fall	140 lbs	140 lbs	Hammer Type		Drill Rod Size (OD)	
	30"	30"	Safety		2.625"	

Backfill Type:

Observation Well Installed YES NO

Estimated Groundwater Level _____

Based On Soil Moisture
 Mud Level
 Observation Well Reading

NOTES: _____

DEPTH (feet)	GRAPHIC LOG	CASING (Blows/ft) CORING (Min./ft)	SAMPLE			SPT (Blows/6 in.)					FIELD CLASSIFICATION AND REMARKS		
			TYPE	NUMBER	SYMBOL	DEPTH (feet)	0'-6"	6'-12"	12'-18"	18'-24"			REC. (in.)
							CORING						
							RUN (in.)	REC (in.)	REC (%)	L>4 (in.)			RQD (%)
											Depth	Elev.	
5			S	1	/	1.0 - 3.0	17	22	21	6	8	Brown c-f SAND, some c-f Gravel, some Silt, moist, (SM), (FILL).	
			S	2	/	3.0 - 5.0	6	6	8	4	14	Gray-brown c-f SAND, and clayey Silt, little f Gravel, moist, (SM), (FILL).	5.0
			S	3	/	5.0 - 7.0	7	5	6	8	20	Gray Silty CLAY, trace f Sand, PP=0.75tsf, moist, (MH).	7.0
			S	4	/	7.0 - 9.0	6	8	10	10	20	Gray m-f SAND, trace Silt, moist, (SP).	
10			S	5	/	9.0 - 11.0	10	15	18	25	18	Gray m-f SAND, trace Silt, moist, (SP).	
												Fibrous PEAT in cutting 11'-13'.	13.0
15			S	6	/	15.0 - 17.0	5	8	9	9	16	Gray SILT, little f Sand, moist, (CL-ML).	18.0
20			S	7	/	20.0 - 22.0	19	19	15	10	12	Gray c-f SAND, some c-f Gravel, little Silt, moist, (SM).	

YU BORING LOG-SCA 17264 DATABASE.GPJ 17264 LIBRARY.GLB 12/20/17

PP = Pocket penetrometer readings (tsf)



& Associates

BORING LOG

(continued)

BORING NUMBER: **B-4**

SHEET NUMBER: 2 of 2

PROJECT NUMBER: **17264**

PROJECT: **Playland Rehabilitation and Upgrades**

CONTRACTOR: **(WGI)**

LOCATION: **1 Playland Pkwy, Rye, NY 10580**

DRILLER: **E. Cardona**

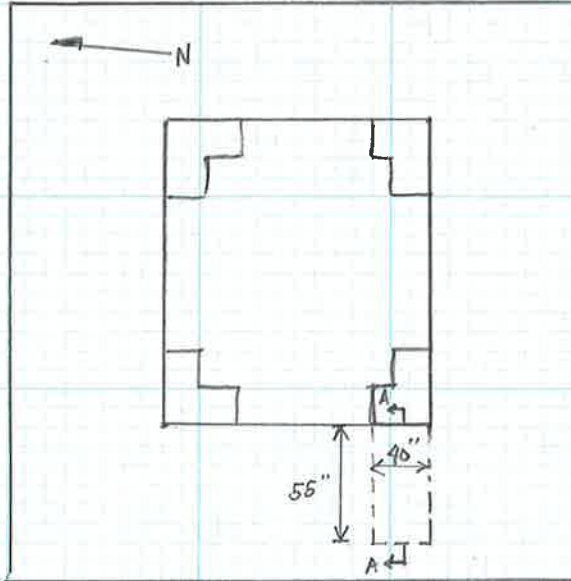
CLIENT: **The Liro Group**

INSPECTOR: **M. Policastro**

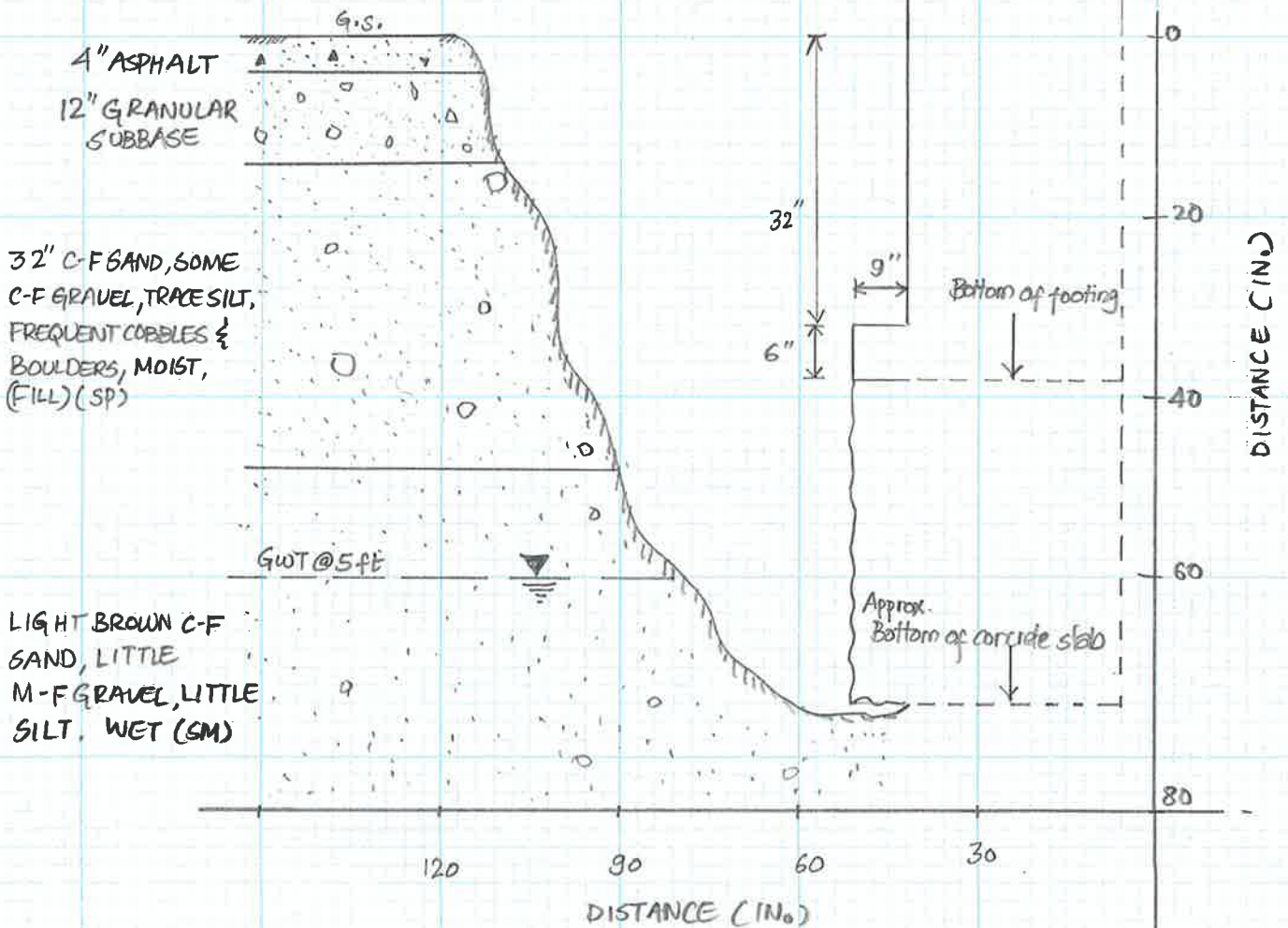
DEPTH (feet)	GRAPHIC LOG	CASING (Blows/ft) CORING (Min./ft)	SAMPLE			SPT (Blows/6 in.)					FIELD CLASSIFICATION AND REMARKS	
			TYPE	NUMBER	SYMBOL	DEPTH (feet)	0'-6"	6'-12"	12'-18"	18'-24"		REC. (in.)
							CORING					
							RUN (in.)	REC (in.)	REC (%)	L>4 (in.)		RQD (%)
30			S	8		25.0 - 27.0	12	20	28	20	20	Gray c-f SAND, and c-f Gravel, some Silt, moist, (SM).
33.0			S	9		30.0 - 32.0	20	20	25	28	20	Gray c-f SAND, little Silt, trace f Gravel, moist, (SM).
35			S	10		35.0 - 37.0	29	33	35	50/3	18	Gray Clayey SILT, some c-f Sand, little c-f Gravel, moist, (ML).
37.0												End of Boring at 37 feet
40												
45												
50												
55												

YU BORING LOG-SCA 17264_DATABASE.GPJ 17264_LIBRARY.GLB 12/20/17

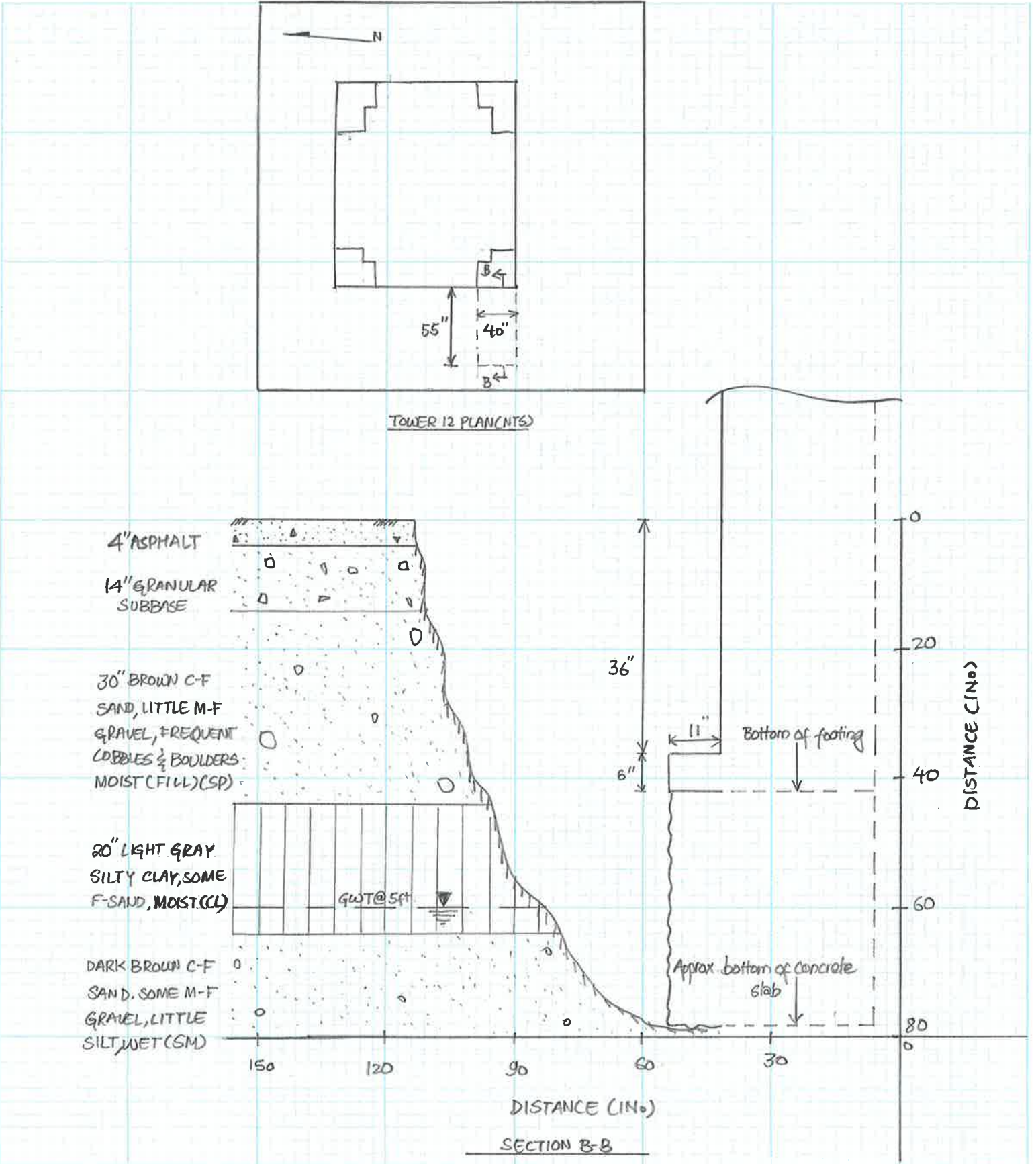
TOWER-11 (TP-1)



TOWER II PLAN (NTS)



SECTION A-A



CLIENT NAME:
LiRo Group

PROJECT NAME:
Playland Rehabilitation and Upgrades

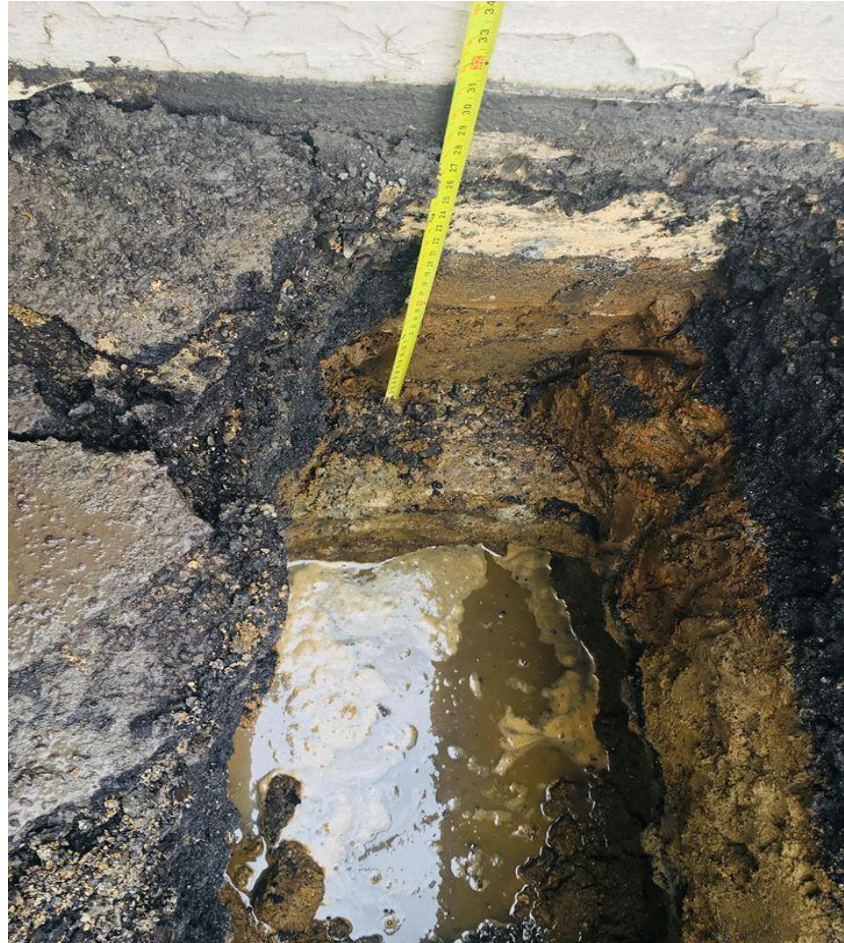
PROJECT NUMBER:
18063

Photo #
Tower 11
TP-1

Date:
05/07/18

Description:

The column is supported on concrete footing extending to approximately 38-inch below ground surface. There is a concrete slab approximately 36-inch thick directly under the footing. Sandy soil is noted under the slab. The footing and slab are in good to fair condition. Fill (sand) extend to about 49 inches below ground surface. Silty sand (SM) was encountered under the marine clay extending to the bottom of excavation. Groundwater is at about 5.5 feet below ground surface.



CLIENT NAME:
LiRo Group

PROJECT NAME:
Playland Rehabilitation and Upgrades

PROJECT NUMBER:
18063

Photo #
Tower 12
TP-2

Date:
05/07/18

Description:

The column is supported on concrete footing extending to approximately 42-inch below ground surface. There is a concrete slab approximately 33-inch thick directly under the footing. Sandy soil is noted under the slab. The footing and slab are in good to fair condition. Fill (sand) extend to about 49 inches below ground surface. There is a firm marine clay (about 20-inch thick) under the fill. Silty sand (SM) was encountered under the marine clay extending to the bottom of excavation. Groundwater is at about 5.5 feet below ground surface.





BORING LOG

& Associates, Inc.

BORING NUMBER: **B-2**
 SHEET NUMBER: 1 of 2
 PROJECT NUMBER: **16169**

PROJECT: **Rye Playland Upgrades and Rehabilitation**
 PROJECT LOCATION: **Rye, NY**
 CLIENT: **LiRo Group**
 CONTRACTOR: **Aquifer Drilling & Testing, Inc (ADT)**
 DRILLER: **Gus Suri**
 INSPECTOR: **Stefan Cheung**
 DRILLING METHOD: **Mud Rotary**
 RIG TYPE: **CME 55 LC**

LOCATION: **See Boring Location Plan**
 COORD.
 STA. NO: OFFSET:
 SURFACE ELEV.: ± **10.0 feet**
 DATUM: **NAVD88**
 START DATE: **4/3/19** TIME: **9:30 am**
 FINISH DATE: **4/3/19** TIME: **1:30 pm**

Type/Symbol	Casing	Split Spoon	Shelby Tube	Piston	Grab	Core Barrel	GROUNDWATER DATA			
	HW	S <input checked="" type="checkbox"/>	U <input type="checkbox"/>	P <input checked="" type="checkbox"/>	G <input checked="" type="checkbox"/>	C <input type="checkbox"/>	Date	Time	Water Depth (ft)	Note
I.D.	4.0"	1.375"					4/3/19	11:00 AM	8'	Based on sample moisture
O.D.	4.5"	2"								
Length	15.5'	24"								
Hammer Wt.	140 lbs	140 lbs	Hammer Type		Drill Rod Size (OD)					
Hammer Fall	30"	30"	Automatic		NWJ 2.25" (2.625")					

DEPTH (feet)	GRAPHIC LOG	SAMPLE			SPT (Blows/6 in.)					FIELD CLASSIFICATION AND REMARKS		
		CASE (Blows/ft) CORING (Min./ft)	TYPE	NUMBER	SYMBOL	DEPTH (feet)	0"-6"	6"-12"	12"-18"		18"-24"	REC. (in.)
							CORING					
							RUN (in.)	REC (in.)	REC (%)		L>4 (in.)	RQD (%)
											Depth	Elev.
											1.0	9.0
											3.0	7.0
5			S	1	1.0 - 3.0	31	18	22	14	5		
			S	2	3.0 - 5.0	17	15	21	16	9		
			S	3	5.0 - 7.0	8	8	9	9	8		
			S	4	7.0 - 9.0	8	11	10	11	6		
10			S	5	9.0 - 11.0	18	7	5	6	7		
			S	6	11.0 - 13.0	8	7	7	5	5		
15			S	7	15.0 - 17.0	8	6	4	5	0		
			S	8	20.0 - 22.0	WOR	WOH	4	6	22		
											18.0	-8.0
20												
											23.0	-13.0

BORING LOG HSP2 16169 DATABASE.GPJ 16169 LIBRARY.GLB 4/9/19

woh = sampler advanced by weight of hammer
 wor = sampler advanced by weight of rods
 PP = Pocket Penetrometer field test (ton/square foot)
 TV = Torvane field test (ton/square foot)



BORING LOG

(continued)

BORING NUMBER: **B-2**
 SHEET NUMBER: 2 of 2
 PROJECT NUMBER: **16169**
 CONTRACTOR: **ADT**
 DRILLER: **Gus Suri**
 INSPECTOR: **Stefan Cheung**

PROJECT: **Rye Playland Upgrades and Rehabilitation**
 LOCATION: **Rye, NY**
 CLIENT: **LiRo Group**

DEPTH (feet)	GRAPHIC LOG	CASING (Blows/ft) CORING (Min./ft)	SAMPLE			SPT (Blows/6 in.)					FIELD CLASSIFICATION AND REMARKS	
			TYPE	NUMBER	SYMBOL	DEPTH (feet)	0"-6"	6"-12"	12"-18"	18"-24"		REC. (in.)
							CORING					
			RUN (in.)	REC (in.)	REC (%)	L>4 (in.)	RQD (%)	Depth	Elev.			
30			S	9		25.0 - 27.0	12	12	14	13	14	Brown m-f SAND, trace (+) Silt, wet, (SP-SM).
35			S	10		30.0 - 32.0	12	15	18	13	9	Brown c-f SAND, some (+) c-f Gravel, trace (+) Silt, wet, (SP-SM). Rig chattering 32.5'-33.5'.
40			S	11		35.0 - 37.0	10	8	8	9	4	Brown c-f GRAVEL, some c-f Sand, trace Silt, wet, (GW). Rig chattering 38'-39'.
41.7			S	12		40.0 - 41.7	10	12	16	50/2"	4	Gray c-f GRAVEL, some c-f Sand, trace Silt, wet, (GP). 41.7
45												End of Boring at 41.7 feet
50												NOTES: 1. End of Boring at 41.7 ft. The borehole was backfilled with soil cuttings and repaired with concrete patch. No drums used to store excess soil cuttings.
55												

BORING LOG HSP2 16169_DATABASE.GPJ 16169_LIBRARY.GLB 4/9/19

woh = sampler advanced by weight of hammer
 wor = sampler advanced by weight of rods
 PP = Pocket Penetrometer field test (ton/square foot)
 TV = Torvane field test (ton/square foot)



BORING LOG

& Associates, Inc.

BORING NUMBER: **B-3**
 SHEET NUMBER: 1 of 2
 PROJECT NUMBER: **16169**

PROJECT: **Rye Playland Upgrades and Rehabilitation**
 PROJECT LOCATION: **Rye, NY**
 CLIENT: **LiRo Group**
 CONTRACTOR: **Aquifer Drilling & Testing, Inc (ADT)**
 DRILLER: **Gus Suri**
 INSPECTOR: **Stefan Cheung**
 DRILLING METHOD: **Mud Rotary**
 RIG TYPE: **CME 55 LC**

LOCATION: **See Boring Location Plan**
 COORD. N: **777,866.8** E: **720,656.3**
 STA. NO: **OFFSET:**
 SURFACE ELEV.: **± 10.0 feet**
 DATUM: **NAVD88**
 START DATE: **4/4/19** TIME: **11:30 am**
 FINISH DATE: **4/4/19** TIME: **1:30 pm**

Type/Symbol	Casing	Split Spoon	Shelby Tube	Piston	Grab	Core Barrel	GROUNDWATER DATA			
	HW	S <input checked="" type="checkbox"/>	U <input type="checkbox"/>	P <input checked="" type="checkbox"/>	G <input checked="" type="checkbox"/>	C <input type="checkbox"/>	Date	Time	Water Depth (ft)	Note
I.D.	4.0"	1.375"					4/4/19	12:30 PM	9'	Based on sample moisture
O.D.	4.5"	2"								
Length	15.5'	24"								
Hammer Wt.	140 lbs	140 lbs	Hammer Type		Drill Rod Size (OD)					
Hammer Fall	30"	30"	Automatic		NWJ 2.25" (2.625)"					

DEPTH (feet)	GRAPHIC LOG	SAMPLE			SPT (Blows/6 in.)					FIELD CLASSIFICATION AND REMARKS		
		CASE NO.	TYPE	SYMBOL	DEPTH (feet)	0"-6"	6"-12"	12"-18"	18"-24"		REC. (in.)	
						CORING						
						RUN (in.)	REC (in.)	REC (%)	L>4 (in.)		RQD (%)	
										Depth	Elev.	
0.0 - 2.0	S 1			7	7	7	8	12		Brown c-f SAND, little (+) Silt, little f Gravel, moist, (SM), (FILL).		
2.0 - 4.0	S 2			8	5	5	6	8		Brown c-f SAND, little Silt, little f Gravel, moist, (SM), (FILL).		
4.0 - 6.0	S 3			18	10	9	9	14		Brown m-f SAND, little m-f Gravel, trace Silt, moist, (SP).	4.0	
6.0 - 8.0	S 4			10	8	6	5	16		Brown c-f SAND, trace (+) m-f Gravel, trace Silt, moist, (SP).		
8.0 - 10.0	S 5			4	3	3	8	15		Gray c-f SAND, trace f Gravel, trace Silt, wet, (SP).		
10.0 - 11.5	S 6A			12	13	10	14	10		Gray c-f SAND, trace Silt, trace f Gravel, wet, (SP).		
11.5 - 12.0	S 6B							6		Gray f SAND, some Silt, occasional root fragments, organic odor, wet, (SM).	12.0	
15.0 - 17.0	S 7			WOH	WOH	WOH	WOH	24		Installed casing to 14'. Gray Organic Silty CLAY, trace f Sand, occasional wood fragments, moist, (OH).	-2.0	
20.0 - 22.0	S 8			WOH	WOH	2	6	24		Same as above.		
											23.5	-13.5

BORING LOG HSP2 16169_DATABASE.GPJ 16169_LIBRARY.GLB 4/9/19

woh = sampler advanced by weight of hammer
 wor = sampler advanced by weight of rods
 PP = Pocket Penetrometer field test (ton/square foot)
 TV = Torvane field test (ton/square foot)



BORING LOG

(continued)

BORING NUMBER: **B-3**
 SHEET NUMBER: 2 of 2
 PROJECT NUMBER: **16169**

PROJECT: **Rye Playland Upgrades and Rehabilitation**
 LOCATION: **Rye, NY**
 CLIENT: **LiRo Group**

CONTRACTOR: **ADT**
 DRILLER: **Gus Suri**
 INSPECTOR: **Stefan Cheung**

DEPTH (feet)	GRAPHIC LOG	CASING (Blows/ft) CORING (Min./ft)	SAMPLE			SPT (Blows/6 in.)					FIELD CLASSIFICATION AND REMARKS	
			TYPE	NUMBER	SYMBOL	DEPTH (feet)	0"-6"	6"-12"	12"-18"	18"-24"		REC. (in.)
							CORING					
			RUN (in.)	REC (in.)	REC (%)	L>4 (in.)	RQD (%)	Depth	Elev.			
30			S	9	25.0 - 27.0	10	13	25	27	8	Gray c-f SAND, little c-f Gravel, trace Silt, wet, (SP).	
30			S	10	30.0 - 32.0	9	10	11	12	14	Brown c-f SAND, trace Silt, wet, (SP).	
32.0											End of Boring at 32 feet	
35											NOTES: 1. End of Boring at 32 ft. The borehole was backfilled with soil cuttings and repaired with concrete patch. No drums used to store excess soil cuttings.	
40												
45												
50												
55												

BORING LOG HSP2 16169_DATABASE.GPJ 16169_LIBRARY.GLB 4/9/19

woh = sampler advanced by weight of hammer
 wor = sampler advanced by weight of rods
 PP = Pocket Penetrometer field test (ton/square foot)
 TV = Torvane field test (ton/square foot)



BORING LOG

& Associates, Inc.

BORING NUMBER: **B-4**

SHEET NUMBER: 1 of 2

PROJECT NUMBER: **16169**

PROJECT: **Rye Playland Upgrades and Rehabilitation**

PROJECT LOCATION: **Rye, NY**

CLIENT: **LiRo Group**

CONTRACTOR: **Aquifer Drilling & Testing, Inc (ADT)**

DRILLER: **Gus Suri**

INSPECTOR: **Stefan Cheung**

DRILLING METHOD: **Mud Rotary**

RIG TYPE: **CME 55 LC**

LOCATION: **See Boring Location Plan**

COORD. N: **777,853.5** E: **720,597.0**

STA. NO: OFFSET:

SURFACE ELEV.: ± **10.0** feet

DATUM: **NAVD88**

START DATE: **4/3/19** TIME: **2:30 pm**

FINISH DATE: **4/4/19** TIME: **11:00 am**

Type/Symbol	Casing	Split Spoon	Shelby Tube	Piston	Grab	Core Barrel	GROUNDWATER DATA			
	HW	S <input checked="" type="checkbox"/>	U <input type="checkbox"/>	P <input checked="" type="checkbox"/>	G <input checked="" type="checkbox"/>	C <input type="checkbox"/>	Date	Time	Water Depth (ft)	Note
I.D.	4.0"	1.375"				2.15"				
O.D.	4.5"	2"				2.95"	4/4/19	8:00 AM	7'	Based on sample moisture
Length	15.5'	24"				5'				
Hammer Wt.	140 lbs	140 lbs	Hammer Type		Drill Rod Size (OD)					
Hammer Fall	30"	30"	Automatic		NWJ 2.25" (2.625")					

DEPTH (feet)	GRAPHIC LOG	SAMPLE			SPT (Blows/6 in.)					FIELD CLASSIFICATION AND REMARKS		
		Casing (Blows/ft) CORING (Min./ft)	TYPE	NUMBER	SYMBOL	DEPTH (feet)	0"-6"	6"-12"	12"-18"		18"-24"	REC. (in.)
							CORING					
							RUN (in.)	REC (in.)	REC (%)		L>4 (in.)	RQD (%)
											Depth	Elev.
			S	1	0.5 - 2.5	11	10	9	8	12	0.5	9.5
			S	2	2.5 - 4.5	10	9	9	8	9		
5			S	3	4.5 - 6.5	3	2	6	5	5	4.5	5.5
			S	4	6.5 - 8.5	5	5	4	8	6		
10			S	5	8.5 - 10.5	22	14	5	2	8		
			S	6	10.5 - 12.5	3	2	4	3	10	10.5	-0.5
15			S	7	15.0 - 17.0	WOH	WOH	2	3	22		
20			S	8	20.0 - 20.0	50/0"				0	18.5	-8.5

BORING LOG HSP2 16169 DATABASE.GPJ 16169 LIBRARY.GLB 4/9/19

woh = sampler advanced by weight of hammer
 wor = sampler advanced by weight of rods
 PP = Pocket Penetrometer field test (ton/square foot)
 TV = Torvane field test (ton/square foot)



BORING LOG

& Associates, Inc. (continued)

BORING NUMBER: **B-4**
 SHEET NUMBER: 2 of 2
 PROJECT NUMBER: **16169**

PROJECT: **Rye Playland Upgrades and Rehabilitation**
 LOCATION: **Rye, NY**
 CLIENT: **LiRo Group**

CONTRACTOR: **ADT**
 DRILLER: **Gus Suri**
 INSPECTOR: **Stefan Cheung**

DEPTH (feet)	GRAPHIC LOG	CASING (Blows/ft) CORING (Min./ft)	SAMPLE			SPT (Blows/6 in.)					FIELD CLASSIFICATION AND REMARKS		
			TYPE	NUMBER	SYMBOL	DEPTH (feet)	0"-6"	6"-12"	12"-18"	18"-24"		REC. (in.)	
							CORING						
							RUN (in.)	REC (in.)	REC (%)	L>4 (in.)		RQD (%)	
											Depth	Elev.	
			S	9		25.0 - 25.2	50/2"					1	Decomposed rock fragments.
													27.0 ----- -17.0
30			C	1		27.0 - 32.0	60	51.5	85.8	25	41.6		Dark gray GNEISS/SCHIST, moderately to highly weathered, strong to moderately strong rock, close to extremely close fracture spacing, except medium fracture spacing from 30.3'-31.25'. Foliation angle 45 degree to 80 degree.
													32.0 ----- -22.0
													End of Boring at 32 feet
35													NOTES: 1. End of Boring at 32 ft. The borehole was backfilled with soil cuttings and repaired with concrete patch. No drums used to store excess soil cuttings.
40													
45													
50													
55													

BORING LOG HSP2 16169_DATABASE.GPJ 16169_LIBRARY.GLB 4/9/19

woh = sampler advanced by weight of hammer
 wor = sampler advanced by weight of rods
 PP = Pocket Penetrometer field test (ton/square foot)
 TV = Torvane field test (ton/square foot)

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SECTION 321216 - ASPHALT PAVING

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. Cold milling of existing asphalt pavement.
2. Hot-mix asphalt patching.
3. Hot-mix asphalt paving.
4. Hot-mix asphalt overlay.
5. Asphalt curbs.
6. Asphalt traffic-calming devices.
7. Asphalt surface treatments.

B. Related Requirements:

1. Section 024116 "Structure Demolition" and Section 024119 "Selective Demolition" for demolition and removal of existing asphalt pavement.
2. Section 312000 "Earthwork" for subgrade preparation, fill material, separation geotextiles, unbound-aggregate subbase and base courses, and aggregate pavement shoulders.

1.3 UNIT PRICES

- A. Work of this Section is affected by Tonnage.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Rye Playland.

1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
 - a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
 - b. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.

CONTRACT No. 22-523
DIVISION 32 – EXTERIOR IMPROVEMENTS

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include technical data and tested physical and performance properties.
 - 2. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
 - 3. Job-Mix Designs: For each job mix proposed for the Work.
- B. Samples for Verification: For the following product, in manufacturer's standard sizes unless otherwise indicated:
 - 1. Paving Fabric: 12 by 12 inches (300 by 300 mm) minimum.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and testing agency.
- B. Material Certificates: For each paving material. Include statement that mixes containing recycled materials will perform equal to mixes produced from all new materials.
- C. Material Test Reports: For each paving material, by a qualified testing agency.
- D. Field quality-control reports.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: **A paving-mix manufacturer registered with and approved by Westchester County and/or NYSDOT.**
- B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.
- C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Westchester County DPW for asphalt paving work.
 - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
 - 1. Prime Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
 - 2. Tack Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
 - 3. Slurry Coat: Comply with weather limitations in ASTM D 3910.
 - 4. Asphalt Base Course: Minimum surface temperature of 40 deg F (4.4 deg C) and rising at time of placement.

CONTRACT No. 22-523
DIVISION 32 – EXTERIOR IMPROVEMENTS

5. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.6 deg C) at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: ASTM D 692/D 692M, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.
- C. Fine Aggregate: **ASTM D 1073 or AASHTO M 29**, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.
 1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.
- D. Mineral Filler: **ASTM D 242/D 242M or AASHTO M 17**, rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

- A. Asphalt Binder: ASTM D 6373 or AASHTO M 320 binder designation PG 70-22.
- B. Asphalt Cement: ASTM D 3381/D 3381M for viscosity-graded material or ASTM D 946/D 946M for penetration-graded material.
- C. Cutback Prime Coat: ASTM D 2027/D 2027M, medium-curing cutback asphalt, MC-30 or MC-70.
- D. Emulsified Asphalt Prime Coat: ASTM D 977 or AASHTO M 140 emulsified asphalt, or ASTM D 2397/D 2397M or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.
- E. Tack Coat: ASTM D 977 or AASHTO M 140 emulsified asphalt, or ASTM D 2397/D 2397M or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.
- F. Fog Seal: ASTM D 977 or AASHTO M 140 emulsified asphalt, or ASTM D 2397/D 2397M or AASHTO M 208 cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.
- G. Water: Potable.
- H. Undersealing Asphalt: ASTM D 3141/D 3141M; pumping consistency.

CONTRACT No. 22-523
DIVISION 32 – EXTERIOR IMPROVEMENTS

2.3 AUXILIARY MATERIALS

- A. Recycled Materials for Hot-Mix Asphalt Mixes: Reclaimed asphalt pavement; reclaimed, unbound-aggregate base material from sources and gradations that have performed satisfactorily in previous installations, equal to performance of required hot-mix asphalt paving produced from all new materials.
- B. Herbicide: Commercial chemical for weed control, registered by the EPA, and not classified as "restricted use" for locations and conditions of application. Provide in granular, liquid, or wettable powder form.
- C. Sand: ASTM D 1073 or AASHTO M 29, Grade No. 2 or No. 3.
- D. Paving Geotextile: AASHTO M 288 paving fabric; nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications.
- E. Joint Sealant: ASTM D 6690, Type I, hot-applied, single-component, polymer-modified bituminous sealant.

2.4 MIXES

- A. Recycled Asphalt Pavement: Reclaimed material in base and surface courses if required.
 - 1. Surface Course Limit: Recycled content no more than 40 percent by weight.
- B. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes approved by Westchester County for base, binder, and top course.
- C. Emulsified-Asphalt Slurry: ASTM D 3910, Type 1.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to begin paving.
- B. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protection: Provide protective materials, procedures, and worker training to prevent asphalt materials from spilling, coating, or building up on curbs, driveway aprons, manholes, and other surfaces adjacent to the Work.
- B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

CONTRACT No. 22-523
DIVISION 32 – EXTERIOR IMPROVEMENTS

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

3.3 COLD MILLING

- A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.
1. Mill to a varied depth to allow for asphalt grades identified in the construction documents.
 2. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.
 3. Control rate of milling to prevent tearing of existing asphalt course.
 4. Repair or replace curbs, driveway aprons, manholes, and other construction damaged during cold milling.
 5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
 6. Patch surface depressions deeper than 1 inch (25 mm) after milling, before wearing course is laid.
 7. Keep milled pavement surface free of loose material and dust.
 8. Do not allow milled materials to accumulate on-site.

3.4 PATCHING

- A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.
1. Undersealing: Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.
 2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.
- C. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).
1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.

CONTRACT No. 22-523
DIVISION 32 – EXTERIOR IMPROVEMENTS

2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- D. Placing Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.
 - E. Placing Patch Material: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.5 REPAIRS

- A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.
 1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.
- B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of **1/4 inch (6 mm)**.
 1. Clean cracks and joints in existing hot-mix asphalt pavement.
 2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.
 3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.

3.6 SURFACE PREPARATION

- A. Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
 1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.
- C. Cutback Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd. (0.7 to 2.3 L/sq. m). Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.
 1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
 2. Protect primed substrate from damage until ready to receive paving.
- D. Emulsified Asphalt Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.10 to 0.30 gal./sq. yd. per inch depth (0.5 to 1.40 L/sq. m per 25 mm depth). Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.

CONTRACT No. 22-523
DIVISION 32 – EXTERIOR IMPROVEMENTS

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
 2. Protect primed substrate from damage until ready to receive paving.
- E. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).
1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.7 PAVING GEOTEXTILE INSTALLATION

- A. Apply **tack coat** uniformly to existing pavement surfaces at a rate of 0.20 to 0.30 gal./sq. yd. (0.8 to 1.2 L/sq. m).
- B. Place paving geotextile promptly according to manufacturer's written instructions. Broom or roll geotextile smooth and free of wrinkles and folds. Overlap longitudinal joints 4 inches (100 mm) and transverse joints 6 inches (150 mm).
- C. Protect paving geotextile from traffic and other damage, and place hot-mix asphalt overlay the same day.

3.8 PLACING HOT-MIX ASPHALT

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
 1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
 2. Place hot-mix asphalt surface course in single lift.
 3. Spread mix at a minimum temperature of 250 deg F (121 deg C).
 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.
 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches (25 to 38 mm) from strip to strip to ensure proper compaction of mix along longitudinal joints.
 2. Complete a section of asphalt base course before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.9 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
1. Clean contact surfaces and apply tack coat to joints.
 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150 mm).
 3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).
 4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints [**using either "bulkhead" or "papered" method according to AIMS-22, for both "Ending a Lane" and "Resumption of Paving Operations."**] [**as shown on Drawings.**] <Insert joint requirement.>
 5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
 6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.10 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
1. Average Density: 96 percent of reference laboratory density according to [ASTM D 6927] [or] [AASHTO T 245], but not less than 94 percent or greater than 100 percent.
 2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041/D 2041M, but not less than 90 percent or greater than 96 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

CONTRACT No. 22-523
DIVISION 32 – EXTERIOR IMPROVEMENTS

- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.11 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 - 1. Base Course: Plus or minus 1/4 inch (13 mm).
 - 2. Surface Course: Plus 1/8 inch (6 mm), no minus.
- B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:
 - 1. Base Course: [**1/4 inch (6 mm)**].
 - 2. Surface Course: [**1/8 inch (3 mm)**].
 - 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).
- C. Asphalt Traffic-Calming Devices: Compact and form asphalt to produce the contour indicated and within a tolerance of plus or minus 1/8 inch (3 mm) of height indicated above pavement surface.

3.12 SURFACE TREATMENTS

- A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal./sq. yd. (0.45 to 0.7 L/sq. m) to existing asphalt pavement and allow to cure. With fine sand, lightly dust areas receiving excess fog seal.
- B. Slurry Seals: Apply slurry coat in a uniform thickness according to ASTM D 3910 and allow to cure.
 - 1. Roll slurry seal to remove ridges and provide a uniform, smooth surface.

3.13 FIELD QUALITY CONTROL

- A. Testing Agency: Westchester County will engage a qualified testing agency to perform tests and inspections.
- B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549/D 3549M.
- C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

CONTRACT No. 22-523
DIVISION 32 – EXTERIOR IMPROVEMENTS

- D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to **ASTM D 979/D 979M or AASHTO T 168**.
 - 1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041/D 2041M, and compacted according to job-mix specifications.
 - 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726/D 2726M.
 - a. One core sample will be taken for every 1000 sq. yd. (836 sq. m) or less of installed pavement, with no fewer than three cores taken.
 - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726/D 2726M.
- E. Replace and compact hot-mix asphalt where core tests were taken.
- F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.14 WASTE HANDLING

- A. General: Handle asphalt-paving waste according to approved waste management plan required by Westchester County.

END OF SECTION 321216

SECTION 32 33 00 - SITE FURNISHINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes the following:
 - 1. Benches

1.2 QUALITY ASSURANCE

- A. Installer Qualification: An experienced installer who has completed installation of site furnishings and whose work has resulted in construction with a record of successful in-service performance.

1.3 SUBMITTALS

- A. Product Data: Include physical characteristics such as shape, dimensions and finish for each bench
- B. Shop Drawings: Provide installation details for each product.
- C. Samples for Verification: For the following product, show the color of the powder coat finish.
- D. Maintenance Data: For each product.
 - 1. Provide recommended methods for repairing damage and abrasions to the powder coat finish.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store products in original undamaged packaging in a dry location until ready for installation.
- B. Handle powder coated products with care to prevent any damage to the finish.

1.5 WARRANTY

- A. All products shall be warrantied against defect in materials and/or workmanship as follows:
 - 1. Limited twenty-year warranty against structural failure of all steel bench frames or complete steel bench assemblies, table frames, litter receptacle frames, steel planters and all cast iron and aluminum bench supports.
 - 2. Limited five-year warranty against structural failure of wood slats.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

CONTRACT No. 22-523
DIVISION 32 – EXTERIOR IMPROVEMENTS

A. Provide products from the following manufacturer:

1. Victor Stanley, Inc.
Phone: 800-368-2573
Website: www.victorstanley.com

2.2 BENCHES

1. Victor Stanley, Victor Stanley C10 Classic Bench

A. Materials:

1. Supports:
 - a. Supports shall be manufactured from 2" (2 3/8" OD) ASTM A513 schedule 40 steel tubing.
2. Seat assembly wood:
 - a. Seat slats shall be manufactured from 2" x 4" nominal Ipe wood slats.
3. Intermediate armrests:
 - a. Intermediate armrests shall be manufactured from 1/4" x 2" ASTM A36 carbon steel flat bar.
4. Anchoring:
 - a. Stainless steel expansion anchors (1/2" x 3 3/4") provided.

B. Dimensions

1. 6 foot bench
 - a. Overall: 71" long x 19 5/16" deep x 30" high

C. Finish:

1. Powder Coating
 - a. All parts are processed through an 8-stage iron phosphorous wash system.
 - b. Parts are coated with a zinc-rich epoxy primer to an AVERAGE of 4-5 mils.
 - c. Parts are then finished with a top coat of TGIC-polyester powder to an AVERAGE of 4-5 mils.
 - d. Powder is cured at the powder manufacturers specifications using combination of infrared and convection heat for approximately 20 minutes.
 - e. Finished parts shall comply with the following American Standard Test Method (ASTM) for coating and coating method: ASTM-D-523, ASTM-D-3363, ASTM-D-1737, ASTM-D-3359, ASTM-D-2794, ASTM-B-117 and ASTM-D-3451.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Handle and install benches according to manufacturer's recommendations and installation instructions.

END OF SECTION 32 33 00

SECTION 33 41 00 - STORM UTILITY DRAINAGE PIPING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Storm drainage piping.
 - 2. Catch basins.
- B. Related Sections:
 - 1. Section 31 23 17 – Trenching.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. ASTM International:
 - 1. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
 - 2. ASTM C14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.
 - 3. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
 - 4. ASTM C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
 - 5. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
 - 6. ASTM C924 - Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.
 - 7. ASTM C969 - Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
 - 8. ASTM C1103 - Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
 - 9. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m<sup>3 - 10. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft³ (2,700 kN-m/m<sup>3 - 11. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
 - 12. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
 - 13. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
 - 14. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
 - 15. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.</sup></sup>

16. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
17. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
18. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
19. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
20. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

C. Civil/ Site Drawings.

1.3 SUBMITTALS

- A. Manufacturer's Installation Instructions: Submit special procedures required to install Products specified.
- B. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents:
 1. Accurately record actual locations of pipe runs, connections, catch basins, and invert elevations.
 2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with Westchester County standards.

PART 2 PRODUCTS

2.1 STORM DRAINAGE PIPING

- A. ADS N-1.2 Corrugated Polyethylene Pipe.

2.2 CATCH BASINS

- A. Furnish materials in accordance with 33 44 13.13.

2.3 BEDDING AND BACKFILL MATERIALS

- A. Bedding: As per section 31 23 23.13 Fill.
- B. Backfilling: As specified in Section 31 23 23.13 Fill.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify trench cut is trimmed, compacted and ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.

3.2 PREPARATION

- A. Hand trim excavations to required elevations. Correct over excavation with fine aggregate.
- B. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

3.3 BEDDING

- A. Excavate pipe trench in accordance with Section 31 23 17 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.
- B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 6 inches compacted depth.
- C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPE

- A. Install pipe, fittings, and accessories in accordance with Westchester County standards.

3.5 INSTALLATION - CATCH BASINS

- A. Install Work in accordance with Westchester County standards.

3.6 FIELD QUALITY CONTROL

- A. Request inspection prior to and immediately after placing aggregate cover over pipe.
- B. Compaction Testing: In accordance with ASTM D1557.
- C. When tests indicate work does not meet specified requirements, remove work, replace and retest.
- D. Frequency of Compaction Tests: one test per 20 liner feet of trench per lift.

3.7 PROTECTION OF FINISHED WORK

- A. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

CONTRACT No. 22-523
DIVISION 33 - UTILITIES

1. Take care not to damage or displace installed pipe and joints during construction of pipe supports, backfilling, testing, and other operations.
2. Repair or replace pipe that is damaged or displaced from construction operations.

END OF SECTION 33 41 00

SECTION 33 44 13.13 – PRECAST CONCRETE CATCH BASINS AND FIELD INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Precast concrete catch basins and field inlets.
- B. Castings.

1.02 RELATED SECTIONS

- A. Section 312316 - Excavation.
- B. Section 312323.13 - Backfilling.
- C. Section 334116 –Corrugated Polyethylene Pipe.

1.03 REFERENCES

- A. ASTM A48 - Gray Iron Castings.
- B. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
- C. ASTM C55 - Concrete Building Brick.
- D. ASTM C150 - Portland Cement.

1.04 SUBMITTALS

- A. Shop Drawings: Indicate dimensions and details of catch basins and castings.
- B. Suppliers: Identify the manufacturer for precast structures and castings.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Store products on firm and level ground.
- B. Handle products in such a manner which will not induce unnecessary stresses, cause cracks to occur or damage the product in any way.
- C. Any cracked or otherwise defective materials will be rejected.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not mix or place mortar if ambient temperature is below 40 degrees F.

CONTRACT No. 22-523
DIVISION 33 - UTILITIES

1.07 COORDINATION

- A. Coordinate with excavation, backfilling, installation of piping and all other work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. OLD CASTLE PRECAST, INC.
- B. SUFFOLK COUNTY PRECAST CORP.
- C. COASTAL PIPELINE PRODUCTS CORP.
- D. Substitutions shall be permitted only after receiving written approval from the Engineer.

2.02 MATERIALS

- A. Catch Basin and Field Inlet Sections: Reinforced precast concrete, lipped male/female joint, of the following materials:
 - 1. Concrete: ASTM C150 normal Portland cement, Type 1; minimum 4,000 psi strength at 28 days.
 - 2. Reinforcement: ASTM A615 reinforcing bars.
 - 3. Castings: ASTM A48, Class 30B, cast iron construction, machined flat bearing surface, non-rocking; removable grate, capable of supporting the AASHTO HS-20-44 highway loading; free from blowholes, shrinkage, distortion, cracks or other defects; smooth and of uniform quality; size and pattern as indicated on the plans, manufactured by CAMPBELL FOUNDRY COMPANY or specifically approved equal.

2.03 ACCESSORIES

- A. Brick: ASTM C55, Grade N, Type I - Moisture Controlled; normal weight; nominal modular size as required.
- B. Mortar: A 1:1:5 ratio of Portland cement, masonry cement and sand, respectively. Add water as required to create a workable consistency.
- C. Catch Basin Steps: Cast iron rungs; pattern number 2589 as manufactured by CAMPBELL FOUNDRY COMPANY; pattern number R-1980-C as manufactured by NEENAH FOUNDRY COMPANY, or specifically approved equal.
- D. Concrete for Formed Invert: ASTM C150 Portland cement type I, cast in place; 3,000 psi minimum strength at 28 days; dimensions as indicated on the plans.

2.04 FABRICATION

- A. Fabricate and reinforce catch basin to the dimensions as indicated on the plans.

- B. Pipe Entry: Provide openings as required.
- C. Steps: Set or drilled and grouted in the catch basin wall at 18 inches on center vertically.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify existing grades are as indicated on the plans.
- B. Verify items provided by other sections of work are properly sized and located.
- C. Verify that rough openings for piping are as required.

3.02 INSTALLATION

- A. Form bottom of excavation clean and smooth to correct elevation. Compact bottom of the excavation to a minimum of 95 percent of maximum dry density.
- B. Place catch basin, secure and level, to the proper elevation. Utilize a placement method which will not damage or crack the catch basin.
- C. Place catch basin sections plumb and level, trim to correct elevations.
- D. Cut and fit for pipe. Seal openings in wall around pipe with brick and mortar. Establish elevations and pipe inverts for inlets and outlets as indicated on the plans. Trowel surfaces smooth.
- E. When indicated on the plans, place concrete in base of catch basin as required to form invert to the dimensions indicated on the plans. Trowel smooth.
- F. Set slab top on catch basin in a 1 inch mortar bed.
- G. Mount casting in a 1 inch mortar bed over access opening. Install firm, level and to the required elevation.
- H. If required to achieve proper elevation of casting, adjust with brick and mortar. A maximum height of 5 inches is permitted between the catch basin and the base of the casting. Maintain a maximum of 1 inch thickness of mortar between all bricks.

3.03 TOLERANCES

- A. Maximum Variation from Proposed Rim Elevation: 1/4 inch.
- B. Maximum Variation from Proposed Location: 1/2 inch.

3.04 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 014500.

CONTRACT No. 22-523
DIVISION 33 - UTILITIES

- B. Request inspection prior to backfilling around structure and prior to surface restoration.

3.05 PROTECTION

- A. Protect finished work under provisions of Section 015000.
- B. Protect catch basin from damage or displacement until project is accepted by the Owner.

END OF SECTION

SECTION 33 44 16 – TRENCH DRAIN

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Trench drain.

1.02 RELATED SECTIONS

- A. Section 312316 - Excavation.
- B. Section 312323.13 - Backfilling.
- C. Section 033000 - Concrete: Base for trench drain.

1.03 SUBMITTALS

- A. Product Data: Indicate all components of trench drain system.
- B. Manufacturer's Instructions: Indicate special procedures and conditions required for proper installation of all items.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products to the site in a safe manner.
- B. Do not handle products in any manner which will cause damage.

1.05 COORDINATION

- A. Coordinate installation with concrete work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. ABT, INC.; Polydrain:
 - 1. Parking Lot: Polydrain with 502 grate (part #512).
 - 2. Walkway: Polydrain with 564 grate.
- B. ZURN PLUMBING PRODUCTS GROUP:
 - 1. Parking Lot: Z886-HDD
 - 2. Walkway: Z886-RPG
- C. Substitution shall be permitted only after receiving written approval from the Architect/Engineer.

2.02 MATERIALS

- A. Trench Drain: Precast polymer concrete; pre-sloped and interlocking.
- B. Casting:
 - 1. Parking Lot: Ductile iron; load class C; equipped with a locking device.
 - 2. Walkway: Galvanized steel; load class A; equipped with a locking device.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions.
- B. Verify excavation is properly sized and ready to accept work of this section.

3.02 INSTALLATION

- A. Install concrete support in trench. Refer to Section 033000.
- B. Install trench drain in accordance with manufacturer's instructions and as indicated on the plans.
- C. Install grates. Ensure that grates do not rock.

3.03 CLEANING

- A. Remove excess concrete from trench drain.

3.04 PROTECTION

- A. Protect finished work.
- B. Protect trench drain from vehicular traffic and damage until project is accepted by the Owner.

END OF SECTION

SECTION 33 49 13.13 – STORM DRAINAGE AND SEWER MANHOLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Precast concrete manhole sections with tongue-and-groove joints, covers, anchorage and accessories.

1.02 RELATED SECTIONS

- A. Section 312316 - Excavation.
- B. Section 312323.13 - Backfill.

1.03 REFERENCES

- A. ASTM A48 - Gray Iron Castings.
- B. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
- C. ASTM C55 - Concrete Building Brick.
- D. ASTM C150 - Portland Cement.
- E. ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gaskets.
- F. ASTM C478 - Precast Reinforced Concrete Manhole Sections.

1.04 SUBMITTALS

- A. Shop Drawings: Indicate dimensions and details of manhole sections and castings.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products to the site under provisions of Section 016500.
- B. Store products on firm, level ground.
- C. Handle products in a manner which will not induce unnecessary stresses, cause cracks to occur or damage the product in any way.
- D. Any cracked or otherwise defective materials will be rejected.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not mix or place mortar if ambient temperature is below 40 degrees F.

1.07 COORDINATION

- A. Coordinate with installation of piping and all other work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. OLDCASTLE PRECAST, INC.
- B. COASTAL PIPELINE PRODUCTS, INC.
- C. Substitutions shall be permitted only after receiving written approval from the Engineer.

2.02 MATERIALS

- A. Manhole Sections: ASTM C478 reinforced precast concrete lipped male/female joint, ASTM C443 gaskets; of the following materials:
 - 1. Concrete: ASTM C150, normal Portland cement Type I, minimum 4,000 psi strength at 28 days.
 - 2. Reinforcement: ASTM A615 reinforcing bars.
- B. Castings: ASTM A48, Class 30B, cast iron construction, machined flat bearing surface, non-rocking, removable lid, open checkerboard grille lid design; able to support the AASHTO HS-20-44 highway loading; free from blowholes, shrinkage, distortion, cracks or other defects; smooth and of uniform quality; size and dimensions as indicated on the plans; manufactured by CAMPBELL FOUNDRY COMPANY or specifically approved equal.

2.03 ACCESSORIES

- A. Brick: ASTM C55, Grade N, Type I - Moisture Controlled; normal weight; nominal modular size as required.
- B. Mortar: A 1:1:5 ratio of Portland cement, masonry cement and sand, respectively. Add water as required to create a workable consistency.
- C. Manhole Steps: Cast iron rungs; pattern number 2589-2252 as manufactured by CAMPBELL FOUNDRY COMPANY, or specifically approved equal.
- D. Concrete for Formed Invert: ASTM C150 Portland cement Type I, cast in place; 3,000 psi minimum strength at 28 days; wood float finish; dimensions as indicated on the plans.

2.04 FABRICATION

- A. Shaft Construction: Concentric with cone top section; lipped male/female joints with rubber gasket; dimensions and reinforcement as indicated on the plans.
- B. Pipe Entry: Provide openings as required.
- C. Steps: Set or drilled and grouted into manhole wall at 18 inches on center vertically.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing site conditions.
- B. Verify existing grades are as indicated on the plans.
- C. Verify items provided by other sections of Work are properly sized and located.
- D. Verify that rough openings for piping are as required.

3.02 INSTALLATION

- A. Form bottom of excavation clean and smooth to the correct elevation.
- B. Place base pad, secure and level, to the proper elevation. Utilize a placement method which will not damage or crack the manhole.
- C. Place manhole sections plumb and level, trim to correct elevations, anchor to base pad.
- D. Cut and fit for pipe. Seal openings in shaft wall around pipe with brick and mortar. Establish elevations and pipe inverts for inlets and outlets as indicated on the plans. Trowel surfaces smooth.
- E. Place concrete in base of manhole as required to form invert to the dimensions indicated on the plans. Trowel smooth.
- F. Mount castings in a 1 inch mortar bed over access opening. Install firm, level and to the required elevation.
- G. If required to achieve proper elevation of casting, adjust with brick and mortar.

3.03 TOLERANCES

- A. Maximum Variation from Proposed Rim Elevation: 1/4 inch.
- B. Maximum Variation from Proposed Location: 1/2 inch.

3.04 FIELD QUALITY CONTROL

- A. Request inspection prior to backfilling around structure and prior to surface restoration.

3.05 PROTECTION

- A. Protect manhole from damage or displacement until project is accepted by the Owner.

END OF SECTION

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SECTION 33 71 19 – ELECTRICAL UNDERGROUND DUCTS AND MANHOLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Underground system of raceways and handholes.
- B. Related Sections:
 - 1. Section 26 05 33 –Electrical Raceway Systems
 - 2. Section 26 05 26 – Grounding Systems
- C. Furnish and install a complete underground system of raceways, handholes as shown on the Drawings and as specified herein.
- D. All underground systems shall be steel reinforced and concrete encased where shown run under roadways and structures. Remaining underground systems shall be direct buried PVC Schedule 80 Conduit as shown on the Drawings.
- E. The Contractor shall be responsible for setting handholes at the proper elevation such that the pitch of raceways will be towards handholes and away from structures, vaults, and buildings.
- F. Duct bank, handhole depths vary. Coordinate with other utilities, yard piping, yard structures and field conditions to determine required depths and install raceways, handholes at that required depth.
- G. Duct bank routing and manhole/handhole locations shown on the Drawings are diagrammatically depicted. Coordinate with other utilities, yard piping, yard structures and field conditions to determine required paths and depths at no additional cost to the Owner.
- H. Rehabilitate all existing manholes being reused as part of the underground system as specified herein.

1.2 SUBMITTALS

- A. Submit shop drawings and product data, for the following:
 - 1. Handholes
 - 2. Handholes Frames and covers
 - 3. Plastic Duct Spacers
 - 4. Warning tape
 - 5. Buoyancy calculations

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Raceways shall be polyvinyl chloride schedule 80 electrical conduit.
- B. Handholes shall be designed and located as shown on the drawings.
- C. Ground rods and other grounding materials and methods shall be as specified in Section 26 05 26.
- D. Bell ends and plastic duct spacers shall be as manufactured by Carlon; Underground Devices Inc. or approved equal.
- E. Pull line for spare conduits shall be 1/8-in nylon rope.
- F. Detectable Warning Tape
 - 1. Each duck bank section shall be marked by means of a detectable warning tape (tracer tape) as shown on the Drawings. The detectable warning tape shall be capable of being detected or located by either conductive or inductive location techniques.
 - 2. The detectable warning tape shall consist of 5 mil (.005-in) overall thickness; five-ply composition; ultra-high molecular weight; virgin polyethylene; acid; alkaline and corrosion resistant; with 150 pounds of tensile break strength minimum per 6-in width.
 - 3. The top side of the tracer tape shall be color banded red for electrical and high voltage lines, and orange for signal, communication, telephone and fire alarm lines. Tracer tape shall be 4-in wide with four color bands. The tape shall be inscribed with the warning message for the utility such as "CAUTION – ELECTRICAL LINED BURIED BELOW". Tape shall be as manufactured by Mutual Industries, Inc.; Terra Tape, Div. of Reef Industries Inc. or approved equal.
- G. Handhole covers, unless noted otherwise on the drawings, shall be precast polymer concrete, heavy duty type, designed for an ANSI Tier 25 rated loading and conform to ASTM 77. Precast units shall be as manufactured by Quazite/Hubbell or approved equal and constructed to dimensions as shown on the Drawings or as required by code for cable pulling purposes.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install raceways to drain away from buildings. Raceways between handholes shall drain toward the handholes. Raceway slopes shall not be less than 3 in per 100 ft.
- B. Steel reinforce and concrete encase ductbanks where runs pass under roadways or structures. See ductbank detail on the Drawings.
- C. Lay raceway lines in trenches on mats of bank gravel not less than 6 in thick and graded as per site conditions and as specified herein.

- D. Lay raceway lines in trenches on mats of bank gravel not less than 6 in thick and graded as per Paragraph 3.1A.
- E. Use plastic spacers located not more than 4 ft apart to hold raceways in place. Spacers shall provide not less than 2 in clearance between raceways and edge of concrete envelope. Power system raceways shall be separated by 7.5-in center-to-center. Non-power system raceways shall be separated by 4.5-in center-to-center.
- F. The minimum cover for raceway banks shall be 24 in unless otherwise permitted by the Engineer.
- G. Make raceway entrances to buildings, structures, and vaults (except handholes) with rigid steel conduit not less than 10 ft long.
- H. Raceway terminations at handholes shall be with end bells for PVC conduit and insulated throat grounding bushings for steel conduit.
- I. Where bends in raceways are required, use long radius elbows, sweeps and offsets.
- J. Swab all raceways clean before installing cable.
- K. Plug and seal spare raceways watertight at all buildings and structures.
- L. Seal the ends of raceways and make watertight at all buildings and structures.
- M. Rigid galvanized steel elbows shall be used for pad-mounted transformer stub-ups and all stub-ups through concrete floors, walls, and slabs.
- N. A pull line shall be installed and left in all spare raceways.
- O. Install detectable warning tape in all ductbanks. Where trench exceeds 24-in width, provide additional detectable tape runs to mark each side of the ductbank in addition to the one in the center.
- P. Handhole Installation
 1. Place bases on bend of 6-in screened gravel. Set base grade so that a minimum grade adjustment of 4-in of brickwork is required to bring the manhole and handhole frame and cover to final grade. Use precast concrete grade rings or brick and non-shrink mortar to adjust frame and cover to final grade.
 2. Set precast sections plumb with a 1/4-in maximum out-of-plumb tolerance. Seal joints of precast sections with either a rubber O-ring set in a recess, or a flexible joint sealant used in sufficient quantity to fill 75 percent of the joint cavity. Fill the outside and inside joint with non-shrink grout and finished flush with the adjoining surfaces. Caulk the inside of leaking barrel section joints with lead wool or non-shrink grout. If leaks appear in the handholes the inside joints shall be cleaned out and remade in a manner that will result in a watertight joint.
 3. Allow joints to set for 24 hours before backfilling. Backfilling shall be performed by bringing the fill up evenly on all sides.

3.2 CLEANING

- A. All new handholes shall be thoroughly cleaned of all silt, debris, and foreign matter prior to final inspection.

-END OF SECTION-